OUTLOOK '83

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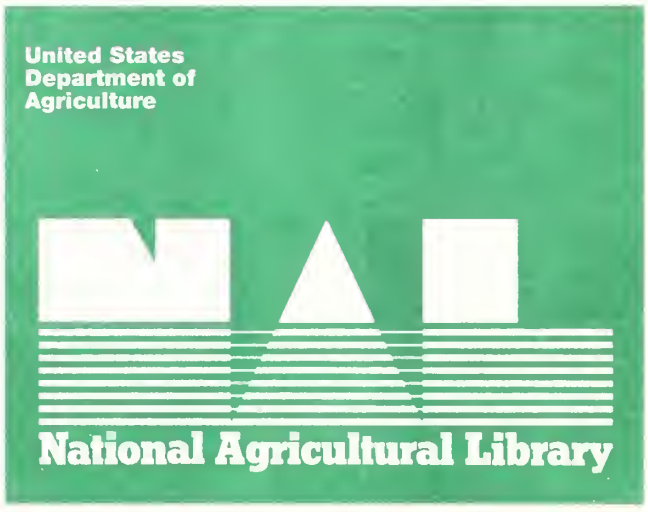
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LONG-TERM STUDY ON NUTRIENT INTAKES

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1983 Agricultural Outlook Conference, Session #25
Washington, D.C.

For Release: Wednesday, December 1, 1982

Dietary intakes are generally recorded for short time periods in order to calculate caloric and nutrient intakes of people. There is always the question of whether records of short time periods are representative of intakes over a longer period of time. Also, it is believed that there may be some tendency for subjects to modify their diets to contain the foods they feel they should be eating.

Subjects are not always adequately trained in keeping accurate and thorough records. The keeping of diet records over a long period of time by carefully trained subjects should give more precise information on actual food intakes and minimize any inaccuracies of a shorter period. If these diet records are then checked and coded for calculation of nutrient intakes by trained interviewers and coders, the accuracy becomes much greater.

In a study conducted at the Beltsville Human Nutrition Research Center, volunteers kept careful, detailed records of food intake for 1 year. The subjects were supplied with measuring cups and spoons and a balance for weighing food. The dietary records were brought in daily except during vacations. The coders interviewed the subjects to assure accurate and precise dietary information. Records were then coded by trained coders under the supervision of a Nutritionist.

The data base used for the calculation of caloric and nutrient content of the diets was constructed from Agriculture Handbooks No. 8-1 through 8-9, from Agriculture Handbook No. 456 (tape version), and from information from food companies. Caloric and nutrient content of recipes supplied by the subjects were calculated and entered into the data base.

The subjects were taking no vitamin or mineral supplements. Medicines were taken occasionally by some of the subjects, and a complete record was kept. One female subject took metamucil frequently, and another was taking synthetic thyroxine regularly.

Four times during the year the subjects collected duplicate samples of all food and beverages consumed for 1 week. Determination of the caloric and nutrient content of these samples will allow for comparison of analyzed values with calculated values. During the same week the subjects also collected all fecal and urine samples. Analyses of these samples will yield information necessary for determining nutrient balances of the subjects consuming their usual diets.

Fasting blood samples were taken 5 times during the year in order to determine whether blood levels of nutrients and other indices reflect nutrient intakes. Blood pressures were taken on the days when fasting blood samples were drawn.

The subjects were divided into the following groups:

Males		Females	
Number	Ages	Number	Ages
7	21-35	8	20-35
6	36-49	8	36-53

Initial heights and weights of the subjects are given below. Weight ranges for the older group of women were from 52.6 to 70.5 kg when the one female weighing 107.3 kg was not included.

	Heights (cm)	Weights (kg)
Males 21-35	170.8 - 181.0	67.5 - 95.3
Males 36-49	163.5 - 178.0	62.1 - 85.4
Females 20-35	150.0 - 170.8	45.0 - 69.7
Females 36-53	157.0 - 167.2	52.6 - 107.3

Each subject was supplied with a weighed salt shaker and was instructed to use this whenever additional salt was desired. Salt shakers were brought in once a week for weighing and determining use of salt. The number of subjects using various amounts of salt in addition to that in their food is given below.

Salt Intake from Salt Shaker

G/week	0	< 1	1	2	3	4	8
Number of Subjects	9	11	3	2	2	1	1

In this paper we compared the caloric and nutrient intakes of our 29 subjects with the average individual intakes obtained in the 1-day USDA Nationwide Food Consumption Survey of 1977-78 for all income levels. That study will be referred to merely as the Survey in the following discussion. Since several of our subjects were under 23 years of age, we have compared intakes of our 20-35 year-old groups with the average intakes of the 19-22 and 23-34 year-old groups in the Survey.

Mean daily caloric intake of the males for 1 year was approximately 300 kcal, or 11%, higher than the average individual intakes in the Survey. Caloric intake of the females was approximately 250 kcal, or 14%, higher than the average intake in the Survey. Intakes of the younger males in our study were 600 calories or 20% higher than for the older males and about 500 calories or 17% higher than for the same age group in the Survey.

Mean protein intakes of the males and females were similar to those reported for the Survey. Fat intakes in our study were also comparable to those reported for the Survey. Carbohydrate intakes were from 18 to 27% higher for the groups in our study than for comparable age groups in the Survey. The differences in caloric intake, therefore, were due to the differences in carbohydrate intake. The carbohydrate intake was 21% higher for the younger than for the older men in our study. The percent of calories from protein, fat, and carbohydrate was 15, 38, and 47, respectively. In the Survey, protein, fat, and carbohydrate accounted for 17, 40, and 43% of the calories, respectively.

Calculated crude fiber intakes were 4.4 g/day for the males and 3.9 g/day for the females. Crude fiber intake in the U.S. during the 1970's has been estimated to be about 4.8 g/day (Heller and Hackler, 1978). The crude fiber method, however, does not measure the total fiber content, since much of the cellulose and hemicellulose is broken down by the acid and alkali treatments used in the method. We determined the neutral detergent fiber content (which includes cellulose, hemicellulose, and lignin) of the food composites during the 4 weeks when the subjects collected food samples. Mean neutral detergent fiber intakes were 9.6 g/day for the males and 7.6 g/day for the females.

Total fat, saturated fat, oleic acid, and linoleic acid intakes were 22, 27, 23, and 18% higher for the younger than for the older males. However, the P/S ratios for all age and sex groups were about 0.4. Cholesterol levels in the diets were 21% greater for the younger than for the older males. Although intakes of cholesterol have probably decreased in the U.S. in the past few years, intakes have been estimated to be in the order of 450-500 mg/day (American Heart Association Committee Report, 1982). Only the younger males in our study had a mean cholesterol intake of this magnitude. Possibly the older males have consciously decreased intake levels of cholesterol.

Mean iron intake for the males was similar to that reported in the Survey, but was 16% higher for the younger males than for the older males. Iron intake of the females was about 12% higher than that in the Survey.

Phosphorus intake for the males was about 12% higher than in the Survey, and was 14% higher for the younger than for the older males. Phosphorus intake was about 13% higher for the females in this study than in the Survey, and was about 15% higher for the younger than for the older females.

Sodium intakes averaged about 3700 mg/day for the males and about 2500 mg/day for the females. Sodium intake was 13% higher for the younger males than for the older males. The amount of salt added to the food from salt shakers did not considerably increase this amount, except in the case of one subject who consumed about 8 g of additional salt per week. It has been estimated that the current daily average intake of sodium in the U.S. is about 3450-4600 mg/day (Abernathy, 1979). A moderate restriction to one-third of this amount has been suggested.

Potassium intakes averaged about 3200 mg/day for the males and 2300 mg/day for the females. A daily intake of at least 3900 mg/day, along with a low sodium intake, has been suggested (Abernathy, 1979). The optimal sodium/potassium ratio has not been determined. The ratio of sodium/potassium in this study was close to 1/1 for all sex and age groups.

Vitamin A intake for the males was about 11% higher than in the Survey. Vitamin A intakes were about 31% higher for the females in this study than in the Survey and were 14% higher for the younger than for the older females.

Vitamin C intake for the males was about 35% higher and for the females about 24% higher than for the same groups in the Survey. Vitamin C intake was 33% higher for the older than for the younger males.

Thiamin intake was about 12% higher for the males and 19% higher for the females than in the Survey. Thiamin intake was 19% higher for the younger than for the older males.

Riboflavin intake was about 11% higher for the males and about 12% higher for the females than in the Survey. Intakes were 18% higher for the younger than the older males and 13% higher for the younger than for the older females.

Niacin intake for the males was 9% higher and for the females 15% higher than in the Survey.

Summary and Conclusions:

Intakes of calories, fat, carbohydrate, saturated fat, oleic acid, linoleic acid, cholesterol, calcium, iron, phosphorus, sodium, thiamin, and riboflavin were more than 10% higher for the younger than for the older males. Intake of vitamin C was 33% higher for the older than for the younger males. Intakes of calcium, vitamin A, and riboflavin were more than 10% higher for the younger than for the older females.

Cholesterol intakes were below the estimated level of intake in the U.S. for all groups except the younger males. The P/S ratios for all age and sex groups were approximately 0.4. Sodium intakes were comparable to the estimated U.S. intake for the males, but were lower for the females. Only one male subject added salt from a salt shaker which exceeded 1 g/day. Analyzed neutral detergent fiber contents (cellulose, hemicellulose, and lignin) of diet composites were about double the calculated crude fiber intakes.

When results were compared with the average individual intakes obtained in the 1-day USDA Nationwide Food Consumption Survey of 1977-78 for all income levels, the following were noted:

Protein and fat intakes were similar.

Intakes of calories, carbohydrate, calcium, phosphorus, vitamin A, vitamin C, thiamin, and riboflavin were higher for both males and females in this study than in the Survey.

Iron and niacin intakes were higher for females in this study than in the Survey.

Due to the extensive study period, the findings in this study provided more representative information on intakes of the subjects than is usually available from short-term nutrient intake studies. The training which the subjects received in keeping accurate food intake records, the provision of a balance for weighing food, the coordination of the interviewing and coding staff, and the attention to detail of the Nutritionist in charge, certainly contributed to the accuracy of the records.

Calculated Mean Daily Intakes for 29 Subjects Studied for 1 Year

Sex and Age	Energy	Protein	Total Fat	Carbo-hydrate	Crude Fiber	Saturated Fat	Oleic Acid	Linoleic Acid	Cho-lesterol	P/S
	Kcal	G	G	G	G	G	G	G	Mg	
Males										
21-35	3033	107.5	127.5	341.3	4.4	48.8	43.8	19.5	496	0.40
36-49	2434	98.5	99.1	270.8	4.5	35.8	33.6	15.9	393	0.44
Females										
20-35	1893	66.9	73.3	222.9	3.7	27.0	25.2	11.8	296	0.42
36-53	1803	69.0	75.9	203.5	4.1	27.6	26.4	11.8	325	0.44

Sex and Age	Calcium	Iron	Phos-phorus	Sodium	Potas-sium	Vitamin A	Vitamin C	Thiamin	Ribo-flavin	Niacin
	Mg	Mg	Mg	Mg	Mg	IU	Mg	Mg	Mg	Mg
Males										
21-35	1145	17.8	1825	3906	3359	6213	111	1.90	2.52	28.0
36-49	980	15.0	1575	3404	3123	5790	166	1.53	2.05	25.9
Females										
20-35	785	12.0	1183	2598	2395	6479	102	1.27	1.62	18.7
36-53	616	12.2	1065	2450	2231	5576	104	1.25	1.41	18.3

SOY PROTEIN AND IRON UTILIZATION

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OUTLOOK '83

1983 Agricultural Outlook Conference, Session #25, Washington, D.C.

For Release: Wednesday, December 1, 1982

The level of absorption of iron from the diet depends primarily upon the iron status and iron requirements of the individual. Adult men, with a low iron requirement, absorb only a fraction, usually less than 10 to 15%, of their daily iron intake. Children and menstruating women absorb higher levels reflecting their needs for higher levels of iron than adult men. Likewise, individuals who are iron-deficient have higher levels of absorption than those with adequate body iron stores. The level of iron absorption thus provides a mechanism for maintaining a normal iron status. However, this is possible only if the iron in the diet can be readily absorbed as needed.

Iron in our diets is obtained from both heme-iron and non-heme iron. Heme iron is readily absorbed and its absorption is not affected by other dietary components. The iron in meats (red meats, poultry and fish) is about two-thirds heme-iron and one-third non-heme iron. Non-heme iron, which is poorly absorbed compared to heme iron, is present in non-meat foods as well as in meat. Its absorption is markedly enhanced by the consumption of meat or of ascorbic acid in the same meal. Conversely, absorption of non-heme iron is markedly decreased by consumption of coffee, tea and other substances when these are consumed in the same meal. In a typical mixed diet, about two-thirds of the iron absorbed daily is non-heme iron. Thus, any component which is added to our diets which affects the absorption of non-heme iron is of concern.

In several previous human studies, with whole soy beans or soy protein, levels of iron absorption or utilization were considered adequate (Kuhn et al, 1968; Layrisse et al., 1969; Moore, 1968; Sayers et al., 1973; Young and Janghorbani, 1981). However, in 1980-1981, data from several studies became available which suggested that consumption of specific soy protein products might have a deleterious effect upon the absorption and utilization of dietary iron. In a study conducted at Beltsville in the fall of 1979, 16 or 17 adult men were fed high levels of protein (approximately 1.6 gm protein/kg body weight/day) of which over 70% was provided by either textured soy, soy isolate or animal protein. Each of the three protein sources were consumed for 35 days in a cross-over design. With consumption of the soy isolate, the apparent daily iron balances were markedly lower than when similar levels of textured soy or animal protein were consumed (Table 1).

In 1980, Cook and his co-workers, in a report to AID, presented results from a series of studies with adult men in which iron absorptions from single test meals were determined. They observed a marked reduction in the absorption of non-heme iron in infant food supplements containing soy protein. In a second study, they observed an 81-83% inhibition of absorption with a soy isolate test meal compared to test meals containing egg albumin or casein. When full-fat soy flour, textured soy flour or soy isolate were

TABLE 1

EFFECTS OF SOY PROTEIN ON IRON BALANCES IN 16 OR 17 ADULT MEN CONSUMING APPROXIMATELY 1.6 GM PROTEIN/KG BODY WT/DAY[A]

PRIMARY (>70%) PROTEIN SOURCE	DAILY INTAKE (MG)	APPARENT DAILY BALANCE (MG) DAYS 15-21	DAYS 29-35
TEXTURED SOY	21.3±3.3	-2.9±6.7	-1.4±5.8
SOY ISOLATE	23.4±3.8	-8.4±5.9[B]	-7.9±4.9[B]
ANIMAL PROTEIN	17.5±2.9	-0.3±3.4	-0.8±1.5

[A]FROM BODWELL ET AL., XII INTERNAT. CONGRESS OF NUTRITION, SAN DIEGO, CA, AUGUST 16-21, 1981.
[B]SIGNIFICANTLY LOWER (5% LEVEL) THAN VALUES (X±S.D.) FOR TEXTURED SOY OR ANIMAL DIETS: VALUES FOR TEXTURED SOY AND ANIMAL DIETS NOT SIGNIFICANTLY DIFFERENT.

similarly tested, a 65-92% inhibition of non-heme iron absorption was observed compared to absorptions from egg albumen test meals.

When mixtures of ground beef and textured soy were fed, iron absorptions were decreased by 53-61% (Table 2). Likewise, absorption from a test meal of soy isolate and ground beef was only 20% of that observed with a similar mixture of egg albumen and ground beef (Table 3). In these studies, the ratios of soy protein to beef used were 2 to 2-1/2 times higher than that specified for the USDA School Lunch Program and 3 to 5 times higher than that specified for use by the Department of Defense.

TABLE 2

EFFECTS OF SOY PROTEIN ON NON-HEME IRON ABSORPTION FROM A MEAL CONTAINING BEEF (ADULT MEN)[A]

PROTEIN SOURCE	% ABSORBED	% INHIBITION
100 GM BEEF	3.20	-
BEEF: TEXTURED SOY (3.1)[B]	1.24	61
BEEF: TEXTURED SOY (2:1)[B]	1.51	53
REFERENCE IRON	19.88	-

[A]FROM COOK ET AL., AMER. J. CLIN. NUTR. 34: 2622-2629 (1981); VALUES REPRESENT GEOMETRIC MEANS (N=11).

[B]RATIO OF GROUND BEEF TO UN-REHYDRATED TEXTURED SOY.

TABLE 3

EFFECT OF ADDING 100 GM OF GROUND BEEF TO A SEMI-SNYTHETIC MEAL ON ABSORPTION OF NON-HEME IRON[A]

INCLUDED IN MEAL	% ABSORPTION	RELATIVE % ABSORPTION
EGG ALBUMEN	5.94	100
SOY ISOLATE	0.32	5
EGG ALBUMEN+BEEF	7.47	100
SOY ISOLATE+BEEF	1.44	19

[A]FROM MORCK, LYNCH AND COOK, AMER. J. CLIN. NUTR. 36: 219-228 (1982); VALUES REPRESENT GEOMETRIC MEANS (N=7); 14.7 GM PROTEIN PER TEST MEAL WERE PROVIDED BY EITHER EGG ALBUMEN OR SOY ISOLATE (UNCOOKED).

Soy protein is widely used to extend hamburger in the USDA School Lunch Program and for feeding in the military. In September, 1980, the Department of Defense estimated that military personnel, on the average, each consumed 10 lbs. of soy protein extended ground beef per month. A significant portion (currently, about 15%, Bothwell et al., 1982) of the military personnel were women of childbearing age. Although it was believed that consumption of soy protein extended hamburger did not involve any known risk to any segment of the population, the results of the studies of Cook and his colleagues, together with the results of the Beltsville study, indicated a need for further studies.

A study was initiated at Beltsville to determine, under practical conditions, the effects of consuming beef extended with soy protein on iron status in children, women, and men. The specific objectives were (1) to determine the effects of long-term consumption, under practical conditions, of beef extended with soy protein on iron status of children, women, and men, (2) to compare the possible effects on iron status of consuming beef extended with different types of soy protein preparations, (3) to evaluate the effects of iron fortification on possible alterations in iron status resulting from consumption of beef extended with soy protein, 4) to compare results of possible effects on iron status to results of iron absorption tests conducted with the same adult male participants, and 5) to evaluate possible effects of consuming beef extended with soy protein and beef extended with zinc-fortified soy protein on blood zinc status. The general design of the study and the parameters measured are given (Tables 4 and 5).

TABLE 4

BELTSVILLE STUDY: EFFECTS OF CONSUMING BEEF EXTENDED WITH SOY PROTEIN ON IRON AND ZINC STATUS

DURATION: 180 DAYS

7 PRODUCTS (MEAT PATTIES):

- ALL BEEF
- TEXTURED SOY EXTENDED (FNS; "FE AND ZN FORTIFIED")
- SOY ISOLATE EXTENDED (FNS; "FE AND ZN FORTIFIED")
- SOY CONCENTRATE EXTENDED (FNS; "FE AND ZN FORTIFIED")

227 PARTICIPANTS CONSUMING "MEAT PATTY" MEALS

50 ADULT MALES	(9 MEALS/WEEK)
41 MENSTRUATING ADULT FEMALES	(9 MEALS/WEEK)
115 "SCHOOL-LUNCH" PARTICIPANTS	(7 MEALS/WEEK)
21 OTHER	(7 OR 9 MEALS/WEEK)

62 CONTROLS (BLOOD SAMPLES ONLY)

TABLE 5

PARAMETERS MONITORED

BEGINNING/END OF STUDY

ALL PARTICIPANTS: COMPLETE BLOOD ANALYSES

ALL ADULT MALES: RADIOIRON ABSORPTION (REFERENCE, TEST)

DAYS 0, 41, 90, 132, 181

ALL PARTICIPANTS: FERRITIN AND ZINC

"CONSUMER" PARTICIPANTS

4-DAY DIET RECORDS PRE-STUDY AND BETWEEN DAYS 56-70 AND DAYS 119-133 (63±7 AND 126±7 DAYS)

Three soy protein sources (one isolate, one concentrate, one textured soy flour) were used to extend ground beef. Twenty percent of the ground beef was replaced by reconstituted soy protein. With the hydration procedures used, 20% of the protein in each of the extended products was provided by the soy protein source used in making each specific product. Each of the products was provided to a group of families or households (20-28 participants) as their principal source of protein for one meal a day (children, 6-18 yrs.) or for one or two meals a day (9 of 14 weekly breakfast or meals, adult men and women). Comparable groups of participants were provided with beef extended with soy fortified with iron and zinc or with beef without soy protein. One group of families, a "time and variability" control group, received no ground beef but gave scheduled blood samples similar to the other subjects.

Complete blood analysis were done prior to and upon completion of the 6-month feeding study. At interim times (0, 41, 90, 132 days), small blood samples (5-6 ml) were obtained to determine serum ferritin levels (one of the indicators of iron status). With the adult male subjects, radioiron absorption tests (reference and test protein) were conducted prior to the beginning and upon completion of the feeding study to ascertain the relationship between the results of iron absorption tests and measures of long-term iron status and whether or not "adaptation" had occurred relative to absorption of iron from specific sources. Zinc analyses were done on all samples obtained for ferritin analyses in order to assess blood zinc status throughout the feeding study; however, these results are not included in this discussion.

All of the soy protein preparations used contained the FNS (Food and Nutrition Service) minimum levels of thiamin, riboflavin, niacin, vitamin B6, vitamin B12, and pantothenic acid, and levels of 20 and 140 mg of iron and magnesium, respectively, per 100 gms. of protein. For each of the three soy preparations ("FNS" preparations as described above), identical preparations were fortified by the manufacturer with 60 mg of iron supplied as ferrous fumarate and 25 mgs of zinc supplied as zinc oxide per 100 gms of protein. The specified level of iron fortification used was that allowed by the Food and Drug Administration for use in iron fortification of soy-based infant formulae while the specified level of zinc fortification was a level recommended for this study by staff of the Food and Drug Adminisration.

The beef patties were manufactured by a commercial firm. Final protein content in the raw patties ranged from 16.5 to 17.1% with fat contents between 21.3 and 22.9%. For the patties extended with soy which was not fortified with significant amounts of iron and zinc (FNS patties), iron contents ranged from 10.7 mg (all beef) to 13.7 mg (textured soy) per 100 gms protein (Table 6). For the "Fe and Zn Fortified" soy extended patties, iron levels were 23.4 to 24.3 mg per 100 gm of protein.

TABLE 6

IRON CONTENT OF BEEF PATTIES

	IRON (Fe)
CONTROL (ALL BEEF)[A]	10.7±0.6[A]
EXTENDED WITH:	
TEXTURED SOY (FNS)	13.7±0.8
TEXTURED SOY + Fe AND Zn	24.3±1.2
SOY CONCENTRATE (FNS)	12.7±0.7
SOY CONCENTRATE + Fe AND Zn	23.8±1.4
SOY ISOLATE (FNS)	12.8±0.4
SOY ISOLATE + Fe AND Zn	23.4±0.7

[A] $\bar{x}$± S.D. (BASED ON ANALYSES OF ONE SAMPLE FROM EACH OF 6 PATTIES); VALUES ARE MG/100 GM PROTEIN (N X 6.25).

The study was conducted between December 1981 and July 1982. Compliance was excellent, as monitored by the councilors (one for each 7 or 8 households), diet records, and interviews, with only 2 individuals withdrawing from the study for non-study related, personal problems. The amount of data collected was large. Analyses of the diet records and the statistical analyses of the experimental results, for the most part, have not been completed. However, some preliminary observations can be given.

The level of absorption of the reference iron dose (ferrous ascorbate) is an excellent indicator of iron status. Changes in percentage absorption (geometric) of non-heme iron for the adult male subjects are given in Table 7. For all groups, except the control group, decreased absorptions were observed at the end of the study. This indicates, on average, an improvement in iron status. The laboratory analyses of the samples from the tests for absorption of iron from test meals containing the different beef patties, conducted at the beginning and at the end of the study, have not been completed.

TABLE 7

CHANGE IN PERCENTAGE ABSORPTION (GEOMETRIC) OF REFERENCES NON-HEME IRON (FERROUS ASCORBATE) IN ADULT MALES CONSUMING ALL-BEEF PATTIES OR BEEF PATTIES EXTENDED WITH SOY PROTEIN FOR 180 DAYS[A]

PATTIES CONSUMED	AVERAGE CHANGE (% ABSORPTION)	NUMBER WITH DECREASED ABSORPTION	NUMBER WITH INCREASED ABSORPTION
BEEF	-4.8	6	1
PLUS SOY CONCENTRATE	-3.4	5	2
PLUS SOY ISOLATE	-0.3	4	3
PLUS TEXTURED SOY	-3.1	4	3
PLUS Fe AND Zn FORTIFIED			
SOY CONCENTRATE	-2.6	5[B]	1[B]
SOY ISOLATE	-3.6	6	2
TEXTURED SOY	-10.2	6	1
CONTROL GROUP[C]	+0.7	7	9

[A] MORRIS ET AL. (UNPUBLISHED DATA); INITIAL AND FINAL MEANS (GEOMETRIC) FOR ALL PARTICIPANTS WERE 12.3 AND 8.9 PERCENT ABSORPTION, RESPECTIVELY; [B] NO CHANGE IN ONE SUBJECT; [C] CONTROL GROUP CONSUMED THEIR USUAL DIETS.

We have not completed the statistical analyses of the serum ferritin values obtained. We have two sets of data. The first set is from the ferritin analyses conducted throughout the study and the second set from the analyses of all samples from each individual subject done within the same single analysis (i.e., with the same RIA "kit"). Only the first set of ferritin data has been partially analyzed. The results of these preliminary analyses are given in Tables 8-11 for the ferritin levels observed prior to the beginning (0 days) and at the end (180 days) of the feeding study. There is some risk involved in presenting data based on values for only these 2 time periods. However, with 40 mean values for each of the 4 sex-age groups (a total of 160 means), it is impractical to present values for all 5 blood sampling times. In assessing the importance of any apparent trends or changes between the values obtained at 0 and 180 days, we have considered the values obtained at the interim time periods.

Among the school lunch participants who were non-menstruating, no significant changes between the 2 time periods were observed (Table 8). This was the largest group of participants and the mean values for each sub-group thus appeared to be more consistent, than for the other 3 groups across the 5 blood sampling times. The ferritin levels of a majority of the Control Group participants decreased over the 6-month period.

TABLE 8

CHANGES IN FERRITIN LEVELS (GEOMETRIC) BETWEEN 0 AND 180 DAYS IN SCHOOL-LUNCH NON-MENSTRUATING PARTICIPANTS CONSUMING ALL-BEEF PATTIES OR BEEF PATTIES EXTENDED WITH SOY PROTEIN[A]

PATTIES CONSUMED	AVERAGE CHANGE (NANOGM/ML)	NUMBER WITH INCREASED LEVELS	NUMBER WITH DECREASED LEVELS
BEEF	-0.4	8	8
PLUS SOY CONCENTRATE	-0.9	8	8
PLUS SOY ISOLATE	+0.5	5[B]	5[B]
PLUS TEXTURED SOY	+0.1	6	6
PLUS FE AND ZN FORTIFIED			
SOY CONCENTRATE	+0.8	8[B]	4[B]
SOY ISOLATE	-0.2	8	6
TEXTURED SOY	-1.3	7	7
CONTROL GROUP	-2.4	8	13

[A]FROM BODWELL ET AL. (UNPUBLISHED DATA); INITIAL AND FINAL MEANS (GEOMETRIC) FOR ALL GROUPS WERE 20.1 AND 19.6, RESPECTIVELY.

[B]NO CHANGE IN ONE PARTICIPANT.

Results obtained for the limited number of school lunch participants who were menstruating are given in Table 9. Although not apparent from the data shown, considerable variation was observed within each sub-group. For example, the mean changes observed between 0 and 180 days for the 2 subjects consuming the non-fortified textured soy protein extended patties would appear to be large. However, for these 2 subjects, the mean value observed at day 90 was equivalent to the value observed at day 0 and the mean value observed at 180 days was almost identical to that observed at day 41. Thus, the apparent change between 0 and 180 days has little significance.

TABLE 9

CHANGES IN FERRITIN LEVELS (GEOMETRIC) BETWEEN 0 AND 180 DAYS IN SCHOOL-LUNCH MENSTRUATING PARTICIPANTS CONSUMING ALL-BEEF PATTIES OR BEEF PATTIES EXTENDED WITH SOY PROTEIN[A]

PATTIES CONSUMED	AVERAGE CHANGE (NANOGM/ML)	NUMBER WITH INCREASED LEVELS	NUMBER WITH DECREASED LEVELS
BEEF	+1.3	2	1
PLUS SOY CONCENTRATE	-0.8	1	1
PLUS SOY ISOLATE	+3.0	2	1
PLUS TEXTURED SOY	-10.7	-	2
PLUS Fe AND Zn FORTIFIED			
SOY CONCENTRATE	+6.5	2	1
SOY ISOLATE	-2.1	-	4
TEXTURED SOY	-2.0	2	-
CONTROL GROUP	-1.0	2	3

[A]FROM BODWELL ET AL. (UNPUBLISHED DATA); INITIAL AND FINAL MEANS (GEOMETRIC) FOR ALL GROUPS WERE 22.3 AND 21.2, RESPECTIVELY.

[B]NO CHANGE IN ONE PARTICIPANT.

Among the menstruating adult women (Table 10), statistically significant decreases were observed for the women in the control group who were consuming their usual diets and for the women consuming the meat patties extended with the iron and zinc fortified textured soy. The women in the latter group had minimal iron stores (mean value = <14 nanogm ferritin/ml) prior to, and throughout the 180 day study. Analytical accuracy at these low levels of ferritin is low and assessing the significance of changes in the values obtained is difficult. Further, over 50% of the apparent mean decrease between 0 and 180 days occurred between the day 0 and day 41 sampling times. Excluding some severe event (such as a miscarriage or heavy bleeding), drastic changes in ferritin levels would not be expected to occur within a time-span of 45 days. In any case, the changes observed were similar in magnitude to the statistically insignificant changes observed for the women consuming the unfortified textured soy and not statistically different from the decrease observed for the women in the Control Group who were consuming their usual diets.

TABLE 10

CHANGES IN FERRITIN LEVELS (GEOMETRIC) BETWEEN 0 AND 180 DAYS IN ADULT MENSTRUATING WOMEN CONSUMING ALL-BEEF PATTIES OR BEEF PATTIES EXTENDED WITH SOY PROTEIN[A]

PATTIES CONSUMED	AVERAGE CHANGE (NANOGM/ML)	NUMBER WITH INCREASED LEVELS	NUMBER WITH DECREASED LEVELS
BEEF	-0.3	2	4
PLUS SOY CONCENTRATE	-1.5	3	2
PLUS SOY ISOLATE	-4.4	1	3
PLUS TEXTURED SOY	-4.5	1	5
PLUS Fe AND Zn FORTIFIED			
SOY CONCENTRATE	-1.8	4	3
SOY ISOLATE	+5.8	3	3
TEXTURED SOY	-4.8[B]	1	5
CONTROL GROUP	-3.8[B]	5	6

[A]FROM BODWELL ET AL. (UNPUBLISHED DATA); INITIAL AND FINAL MEANS (GEOMETRIC) FOR ALL GROUPS WERE 19.4 AND 19.3, RESPECTIVELY; CONTROL GROUP CONSUMED THEIR USUAL DIETS.

[B]CHANGE STATISTICALLY SIGNIFICANT AT THE 5% LEVEL.

Values for the adult men are given in Table 11. None of the observed changes were statistically significant. The change between 0 and 180 days for the men consuming textured soy extended patties appears large, but over half of this apparent change was observed between the day 0 and day 41 sampling times. Conversely, for the men consuming the fortified textured soy extended patties, the values between day 41 and day 180 were essentially constant.

TABLE 11

CHANGES IN FERRTIN LEVELS (GEOMETRIC) BETWEEN 0 AND 180 DAYS IN ADULT MEN CONSUMING ALL-BEEF PATTIES OR BEEF PATTIES EXTENDED WITH SOY PROTEIN[A]

PATTIES CONSUMED	AVERAGE CHANGE (NANOGM/ML)	NUMBER WITH INCREASED LEVELS	NUMBER WITH DECREASED LEVELS
BEEF	-7.0	2	5
PLUS SOY CONCENTRATE	-1.5	2	5
PLUS SOY ISOLATE	-3.0	3	4
PLUS TEXTURED SOY	-12.0	2	5
PLUS FE AND ZN FORTIFIED			
SOY CONCENTRATE	-7.2	2	5
SOY ISOLATE	-9.0	1	6
TEXTURED SOY	+6.3	4	3
CONTROL GROUP	-6.5	6	10

[A]FROM BODWELL ET AL. (UNPUBLISHED DATA); INITIAL AND FINAL MEANS (GEOMETRIC) FOR ALL PARTICIPANTS WERE 63.1 AND 58.0, RESPECTIVELY; CONTROL GROUP CONSUMED THEIR USUAL DIETS.

CONCLUSIONS

All of the laboratory and statistical analyses have not been completed. However, the following preliminary observations can be made:

(1) Iron status, as reflected by the level of absorption of the reference iron dose, improved or was not deleteriously affected in the adult men consuming the 7 different types of meat patties for 6 months.

(2) On the basis of the preliminary analyses of one of the two sets of ferritin data, the ferritin levels of participants (children, women, men) who consumed soy-extended beef for 6 months were not deleteriously affected when compared to ferritin levels of similar participants consuming all-beef patties or their normal diets.

(3) These preliminary results suggest that extending ground beef with soy protein at the levels studied did not adversely affect iron utilization in the children, women or men studied.

(4) On the basis of these results, consumption of beef extended with soy protein, at the levels used in this study, by military men or women or by school lunch participants would not appear to impose a risk in these population groups.

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NUTRIENT QUALITY OF DIETS OF RESPONDENTS FROM NATIONWIDE FOOD CONSUMPTION SURVEY 1977-78

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1983 Agricultural Outlook Conference, Session #25

For Release: Wednesday, December 1, 1982

INTRODUCTION

This paper reports some findings from our analysis of the data for individual respondents from the Nationwide Food Consumption Survey of 1977-78 (NFCS). The details of selection of individuals for analysis, the definition of the variables and their construction are contained in our Final Report to the Human Nutrition Information Service. The following is a brief description of the characteristics of the individuals selected into our study population, the variables found to be associated statistically significantly with the quality of the diets, the indices used in evaluating the diets, and the food groupings we used in looking at the intake of the individuals with different qualities of nutritional intake.

1. Selection of the Study Population

Selected were household members who had complete data for age, sex, three-day food intake, were either white or Black and at least four years old and neither pregnant nor nursing nor vegetarian. From all those who met these criteria, we further selected only those who fell into one of the four major meal patterns which we had identified. This left a study population of 21,579 individuals.

2. Four Major Meal Patterns

We obtained frequency distributions of the permutations of numbers of meals reported for the three days of food intake records and found that only four permutations contained enough individuals to permit fruitful analysis. The meals were intake occasions identified as meals by the respondents. We took into account only the number of meals, not the label nor the number of items reported for the individual intake occasions. The four patterns were: 3,3,3: three meals for each of the three days of records; 3,3,2: three meals on any two days and two meals on the third day; 3,2,2: three meals on one of the three days and two meals each on the two other days; 2,2,2: two meals on each of the three days.

3. Snacking Behavior

The respondents identified some intake occasions as snacks, and we characterized them as "snackers" if they recorded one or more such intake occasions as snacks, and as "non-snackers" if no snacks at all were identified. The following table, Table 1, shows the distribution of the study population by meal patterns, sex and snacking behavior.

TABLE 1: Meal Pattern	Males Percent	Females Percent	Total Number	Total Percent	Percent Non-Snackers
3,3,3	65.1	63.2	13,824	64.1	28.8
3,3,2	18.2	18.6	3,973	18.4	15.2
3,2,2	8.6	9.7	1,986	9.2	16.9
2,2,2	8.2	8.4	1,796	8.3	21.0
Total	100.0	100.0		100.0	24.5
Number	9,860	11,719	21,579		5,295

4. Indices of Nutrient Quality of Reported Intakes

We developed three such indices: one reports the number of nutrients for which the 3-day average was below 60.0% of the Recommended Dietary Allowance (RDA). This is the Marginality Index (MI). Seven nutrients were considered when computing this index for respondents. The scores range from 0 to 7, indicating that none, one, two etc. of the seven nutrients considered showed a 3-day average intake below 60.0 percent of the appropriate RDA. The nutrients included consisted of those which showed more than a very few of the respondents with such marginal intake and were:

Vitamin B-6
Calcium
Vitamin A
Vitamin C
Iron
Magnesium
Vitamin B-12.

A second index considered the contribution of the macronutrients protein, fats and carbohydrates to the total caloric intake. This index was labelled PFC Index. The ranges of proportions deemed "desirable" were:

Protein	10.0 - 25.0 percent
Fats	20.0 - 35.0 percent
Carbohydrates	70.0 - 40.0 percent.

Our scoring system permits the identification of intakes within the ranges: For intakes within the ranges for all three macronutrients, a score of "1"; those with two macronutrients within the desirable ranges and one not in such a range, scores of "2", "3" or "4"; those with only one within the desirable range and two without, scores of "5", "6" and "7"; and finally, for those with all three not within the ranges, a score of "8". It was found that almost all with one macronutrient not in range were "off" for fats. Those who were scored as having two macronutrients "off" were almost universally those with problems for fats and carbohydrates. Other combinations amounted to about three percent. Therefore, we report only four categories: all three in balance; fats only out of balance; fats and carbohydrates out of balance; and all other permutations.

A third index consisted of combining the MI and PFC by crosstabulation and collapsing categories into 12 Nutrient Quality (NQ) groups: A through L. Table 6

shows the definitions of the twelve categories and the distribution of the study population, as well as the grouping of the categories into triads which became an analytic unit further on in our work.

5. Grouping Food Items

We developed two schemes for grouping approximately 4,000 of individual food item codes. One system grouped the items according to their major contribution to micronutrients and resulted in 13 groups. The second system considered the role of the food items as menu items and resulted in 32 groups. These different approaches resulted in categorizing milk and cheese, for example, in one group as dairy products in the first scheme, while milk was considered a beverage and constituted its own group in the second scheme.

FINDINGS

1. Intake of Micronutrients

We found that examining intakes of individual micronutrients and using the MI provided quite different information. Table 2 shows the distribution of the study population by categories of intake as % of RDA for individual nutrients and recommended energy intake (REI). Figure 1 shows the age and sex distribution of those in the population who had an MI score of "0": no marginal intake for any of the seven micronutrients considered.

The individual nutrients vary considerably in the percentage of those with marginal intake ($\leq$ 59.9% RDA), ranging from about 35 percent for vitamin B-6 to less than one percent for protein. From Figure 1 it can be seen that the degree of marginality varies significantly by age and sex, and that females from eleven years up show much larger proportions with marginal intake than males. The micronutrients which constitute scores of "1" and higher cannot be inferred from the data in Table 2, since different diets scored as containing one or more marginal micronutrients varied in the permutations of such marginal micronutrients.

Table 3 shows the roles of the seven micronutrients in the diets of varying degree of marginality by sex. We see, for example, that iron intake is marginal for 18.9 percent of the total population (Table 2), but that iron is marginal for only 9.4 percent of those with a single marginal intake (Table 3). The data support the interpretation that individual diets tend to contain different clusters of marginal micronutrients. Table 4, shows the distribution of MI scores for the total population, and sharpens the contrast in findings between consideration of single micronutrient intakes and the MI approach.

2. The Balance of Macronutrients

The PFC score distribution by meal patterns is shown in Table 5. About 20 percent of the total study population had macronutrient intakes which fell into the desirable ratios of contributions to the total caloric intake. Undesirable fat ratios account for most of those who show undesirable ratios, whether for fats alone or fats in combination with carbohydrates.

Data not shown here demonstrated that there was no association between marginality of micronutrient intake and achieving desirable macronutrient balance of total caloric intake. Table 6 shows that those in desirable balance for each of the four triads account for about the same percentage of the triad total. For example, NQ A accounts for 18.4 percent of the 9210 in NQs A plus B plus C; NQ D is 18.8 percent of its triad, NQ G is 19.9 percent and NQ J 22.0 percent of triad NQ J, K and L.

3. Food Intakes of the Twelve Nutrient Quality Groups

We looked at the 3-day average mentions of foods in terms of food groups and the failure to mention intake of any one or more specific group. We kept some groups as defined originally for the menu item scheme: soup, legumes, cereals, starchy protein mixtures, breads, and starchy side dishes. We grouped others to achieve the following combinations: milk and cheese; juices and fruits; juices, fruits and vegetables; "meats" which contain meat, poultry and fish; "fats"; "sugars" which contain soft drinks, toppings, candies, spoon and other desserts.

A. Percentages of No Mentions of Foods by Nutrient Quality Groups

Graphic presentations for "milk and cheese," "juices and fruits," "cereals" and "sugar" groups are shown in Figures 2, 3, 4 and 5. Meats and fats are omitted here since almost every respondent mentioned at least one intake.

The graphs employ the "triads of NQs" scheme of showing the percents of each NQ which did not mention intake of any food item in the particular food group. The most striking finding is that the same pattern is shown within each triad and that only the height of the line varies. Individuals in the first triad contain fewer who report limited intakes, their selection of food items is wider. Overall, and not surprisingly, the triads of NQ groups show that the utilization of foods and food groups decreases as the triads represent increasingly larger numbers of marginal nutrients, and that overall, the diversity of the intake decreases as this marginality increases.

B. Average Mentions of Foods by Nutrient Quality Groups

The next dimension examined was the amount of intake as measured by the average number of mentions of food items by "users", those who mentioned an item in a food group once or more. Figures 6 through 11 show the findings by triads for the food groups. Shown are: milk and cheese; juices and fruits; juices, fruits and vegetables; sugar groups; meat; and fats. Among users, within each food group, the units within triads follow the same patterns of use. Except for meat and fats, generally there is a decrease in average number of mentions from NQ A through NQ L. This decrease is not linear for milk and cheese, where the second unit in the triad shows an increase over the first unit and a decrease for the third unit. In the case of meat and fats, the first unit in the triads show lower average mentions than the second and third units, even though in the case of fats the triads show decreasing average mentions from NQ A through L. For the meat group, the four NQ triads are almost identical both as to pattern and height of the curves.

4. The Effect of Independent Variables on Use and Quantity of Intake of Food Groups by Nutrient Quality Groups

Table 6 shows the distribution of the total study population for the twelve NQs. Statistical tests to determine the independence of 15 variables for the distribution among the NQs were done by using cannonical correlations and redundancy covariations. The variables considered were: sex, age, meal patterns, snacking behavior, race/ethnicity, family composition, size of household,, census region, urban/ rural status, education of head of household, working status of female head of household, Poverty Index, being on a special diet, eating meals out, weight status. Only age, sex, meal patterns and snacking behavior were found to be independent by either of these two statistical tests.

Children, and particularly the youngest, did best in terms of NQ classification and were found in NQs A and B twice as often as their proportion in the total population. Those 11 through 15 years of age were distributed bimodally with proportionately larger percentages in the extreme categories and relatively fewer in the middle categories. As age increased, the proportions of those in the less desirable categories increased in respect to their percentages in the total population. This distribution is most pronounced for the adult population from 23 to 50 years of age. Those older than 50 achieved more desirable intakes but did not reach the levels observed by children. It should be borne in mind that children's intakes were reported by others, presumably their mothers, and that these intakes may not reflect reality entirely, but we have no way of assessing the impact of this factor.

Females under 11 years did as well as males of those ages, but from then on, females showed larger proportions in the less desirable categories of diets than did males. The four meal patterns showed an interesting association, those in pattern 3,3,3 did better than any of the other three meal patterns, with proportionately more respondents in NQs A through E and fewer in NQs I through L. The other three patterns showed respectively less desirable distributions as the total number of meals in the patterns decreased.

Snacking behavior also proved to be associated: those who did not snack did not as well proportionately as those who did snack, with more of them in NQs K and L particularly. Among the snackers, those who reported three or more snacks were more frequently found in NQs A through D, and less frequently in NQs J through L.

Examination of the relationship of 3-day average %REI and NQ distribution points to the enormous problems of achieving intake that is "balanced desirably" for micronutrient and macronutrient intakes. Total caloric intake was found to be associated with both aspects of nutrient quality, but it was NOT a simple association. The higher the %REI the larger the proportions of the population in the least "nutriently marginal" NQs; but also, the larger the proportions of the populations within the ABC triad in the less desirably balanced B and C groups. Equally, the "marginal" or low %REI intake does not unilinearly correlate with either of the two aspects of quality of diets examined. There are lower proportions of individuals in NQ K and L for those with less than 60 percent REI than in B and C for those with $\geq$100 %REI. In other words, and as mentioned before, the degree of marginality for nutrients is not associated with PFC ratios.

The data show that the quality of diets is not dependent on single elements: it is not simply the failure to eat specific food items, nor the absolute amount of specific food items. It seems instead, that the food intake as a totality must be considered in two dimensions: the adequacy of the diversity to provide the different nutrients as well as the distribution of the macronutrients. It is the kinds of foods as well as amounts in relation to total intake that must be considered when planning meals or eating.

5. Conformance With the 4 Food Groups Guidance Scheme and Quality of Diets

Utilizing our 13 food group system, we classified respondents by the number of mentions for each of the four food groups over 3 days and examined distributions of categories of conformance by distribution among the NQs. We limited the categories to five as shown in Table 7. Group 1: 6 or more from the milk and meat groups, and 12 or more from the fruits and vegetables and grains groups; 2: less than in group 1 but at least 5, 5, 10 and 10 mentions respectively; 3: less than in 2, but at least 4, 4, 8, 8; group 4: less than in 3, but at least 3, 3, 6 and 6; group 5: less than in group 4. Work by Dr. Eleanor Pao has shown that mentions usually indicate an intake which equals a serving as defined by the four food groups guidance scheme.

For the total study population, three percent fell into group 1, and 53 percent into group 5. Further, it can be seen that adherence to the guidance scheme does not automatically result in above marginality intake for micronutrients since individuals in the conforming intake category (group 1), were found in NQs D through L. Equally, those in the fifth group were found in all 12 NQs. Proportionately group 1 respondents were found more frequently in NQ A than those from other intake groups, but, equally important was the finding that almost 56 percent of group 1 were found in NQ B, and an additional 14 percent in NQ C. The other groups showed progressively fewer individuals in NQs B and C. At the other end of the NQs, a complete inversion for the five groups was found. For example, percentages in NQ J ranged from less than one percent for groups 1 and 2 to nine percent for the fifth group.

DISCUSSION

When marginality of nutrient intake and ratios of contribution to total caloric intake are both considered, the percentages of the total study population falling into the category indicating no marginal intakes and desirable ratios were about eight percent. The largest proportions were found to have problems with the contribution of fats to total intake. The intake of the population was not found to conform to the recommendations based on the four food groups approach, and further, no simple association was found with the quality of the diets and adherence. The four food groups approach does not address macronutrient ratios of total caloric intake.

Based on the findings from our approach it would appear desirable to reexamine nutrition guidance schemes in order to assist different age and sex groups in the population to achieve satisfactory intakes of micronutrients and desirable ratios of macronutrients within different recommended energy intakes.

TABLE 2 PERCENT DISTRIBUTION OF THREE-DAY AVERAGE INTAKES AS PERCENT RDA FOR ELEVEN NUTRIENTS AND CALORIES (N=21,579)

NUTRIENT	PERCENT RDA ≥100.0	99.9-80.0	79.9-60.0	≤59.9	TOTAL
PROTEIN	90.9	5.7	2.5	.8	100.0
PHOSPHORUS	73.8	14.6	8.2	3.3	100.0
RIBOFLAVIN	68.7	15.6	10.7	5.1	100.0
THIAMIN	56.5	21.2	14.8	7.5	100.0
VITAMIN B-12	68.4	12.8	10.3	8.5	100.0
VITAMIN C	61.6	9.8	10.0	18.7	100.0
IRON	45.9	16.5	18.8	18.9	100.0
MAGNESIUM	23.2	24.1	29.6	23.1	100.0
VITAMIN A	49.6	12.8	14.3	23.3	100.0
CALCIUM	32.6	17.1	20.6	29.7	100.0
VITAMIN B-6	19.1	19.1	27.0	34.8	100.0
CALORIES*	23.4	29.1	31.1	16.4	100.0

* PERCENT OF RECOMMENDED ENERGY INTAKE

FIGURE 1

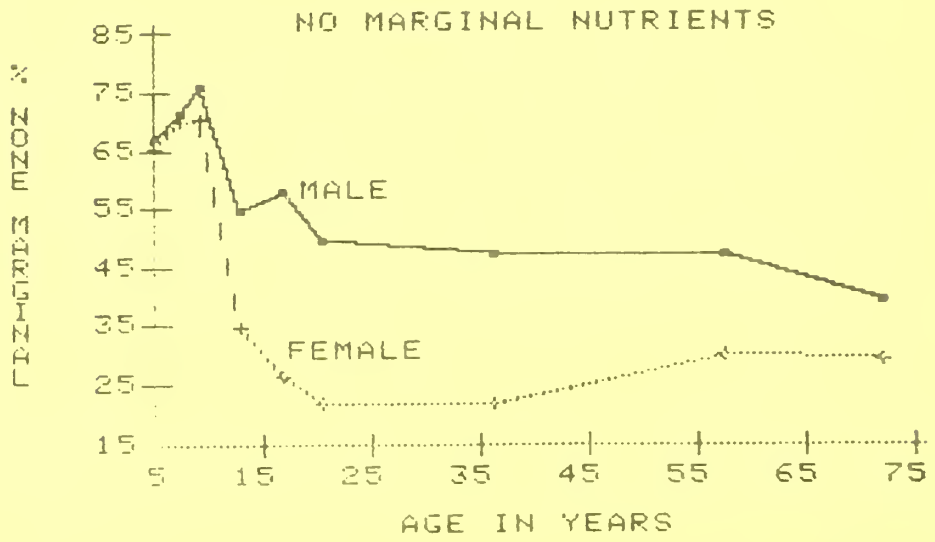


TABLE 3 PERCENT OF INTAKES BY SEX WITH ONE TO SIX MARGINAL NUTRIENTS BY NUTRIENTS INVOLVED

	NUMBER OF MARGINAL NUTRIENTS								
	ONE			TWO			THREE		
NUTRIENT	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL
VITAMIN B-6	23.6	30.4	27.3	40.4	60.3	52.0	67.6	80.4	75.4
CALCIUM	20.4	31.5	26.4	37.4	42.9	40.6	54.4	57.9	55.9
VITAMIN A	27.2	8.3	16.9	46.5	46.5	32.1	59.2	33.5	43.0
VITAMIN C	16.5	10.2	13.1	31.2	19.5	24.4	43.6	28.8	34.1
IRON	3.2	14.5	9.4	34.3	16.6	24.0	11.5	45.1	32.2
MAGNESIUM	8.0	3.1	5.3	7.1	31.7	21.4	57.3	39.9	47.9
VITAMIN B-12	1.1	2.0	1.6	3.2	7.4	5.6	6.1	14.7	11.4
NUMBER	1777	2125	3902	1100	1535	2635	759	1279	2038

	FOUR			FIVE			SIX		
NUTRIENT	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL
VITAMIN B-6	82.7	90.7	88.2	95.9	95.6	95.7	100.0	99.5	99.6
CALCIUM	71.3	74.1	73.2	86.7	85.1	85.5	99.9	98.0	98.1
VITAMIN A	76.5	44.4	54.5	90.5	66.4	72.8	96.1	86.7	88.1
VITAMIN C	55.1	36.5	42.4	72.1	55.3	58.3	83.5	72.8	74.4
IRON	18.4	62.0	48.3	37.5	79.8	68.6	54.4	92.9	87.2
MAGNESIUM	84.7	67.4	72.8	93.7	85.4	87.6	100.0	93.6	94.5
VITAMIN B-12	11.3	24.9	20.6	23.8	34.3	31.5	67.0	56.5	58.0
NUMBER	515	1120	1635	315	872	1187	103	593	696

TABLE 4 Distribution of Intakes by Number of Marginal Nutrients

# Nutrients ≤59.9% RDA	Percent
None	42.7
One	18.1
Two	12.2
Three	9.4
Four	7.6
Five	5.5
Six	3.2
All (7)	1.3
Total	100.0 (21,579)

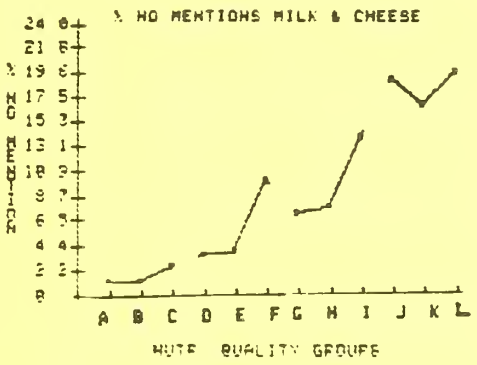
TABLE 5 Percent Distribution of Intakes by Protein-Fat-Carbohydrate (PFC) Score

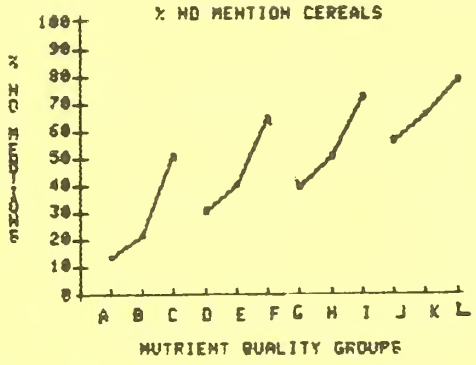
PFC Score	Meal Patterns 3,3,3	3,3,2	3,2,2,	2,2,2	Total Percent	Number
All 3 in Balance	20.1	18.4	19.0	19.1	19.6	4236
Unbalanced						
Fats	48.9	44.3	40.9	35.6	46.2	9976
Fats & Carbohydrates	28.6	34.1	35.8	40.5	31.2	6738
All Others	2.4	3.2	4.3	4.8	2.9	629
Total	100.0	100.0	100.0	100.0	100.0	21579

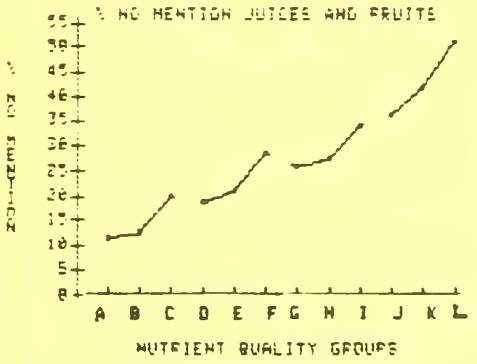
TABLE 6 Distribution of Intakes by Nutrient Quality (NQ) Groups

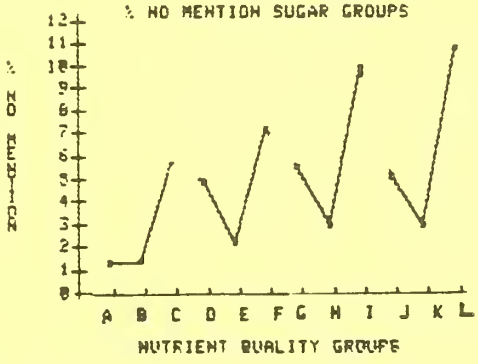
NQ Group	# Marginal Nutrients	PFC Balance	Population Number	Percent
A	0	all 3 balanced	1696	7.9
B	0	1 not balanced	4926	22.8
C	0	≥2 not balanced	2588	12.0
D	1	all 3 balanced	732	3.4
E	1	1 not balanced	1745	8.1
F	1	≥2 not balanced	1425	6.6
G	2	all 3 balanced	524	2.4
H	2	1 not balanced	1139	5.3
I	2	≥2 not balanced	972	4.5
J	≥3	all 3 balanced	1284	6.0
K	≥3	1 not balanced	2402	11.1
L	≥3	≥2 not balanced	2146	9.9

Figures 2, 3, 4, 5 Percent of No Mentions of Food Group by Nutrient Quality Group

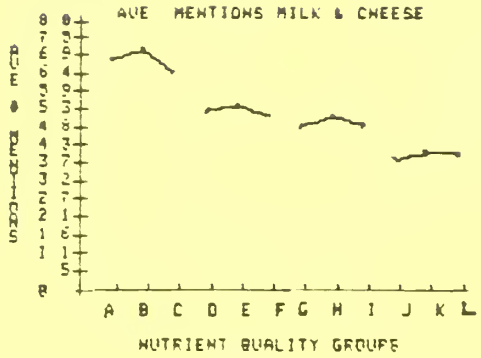


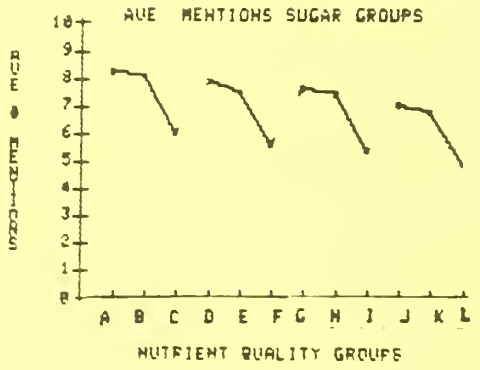


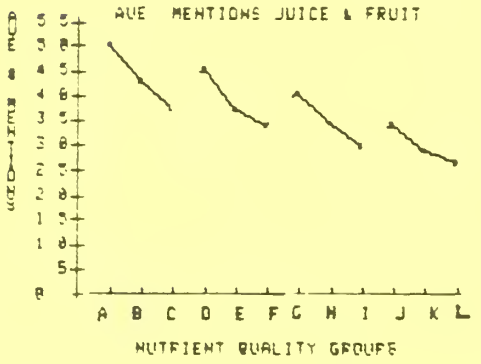


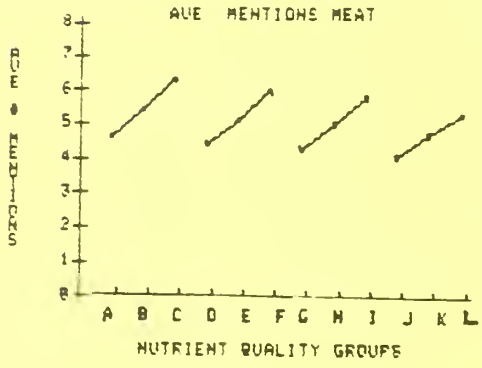


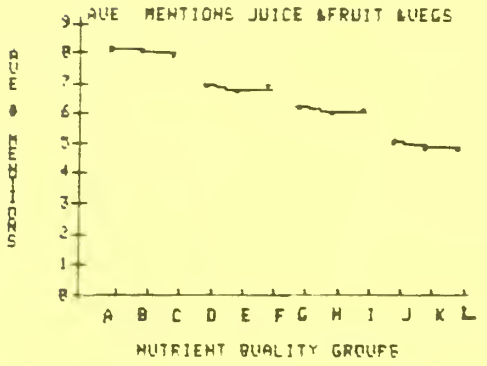
Figures 6,7,8,9, 10 and 11 Percent of Users with Average or More Mentions of Food Groups by Nutrient Quality Group











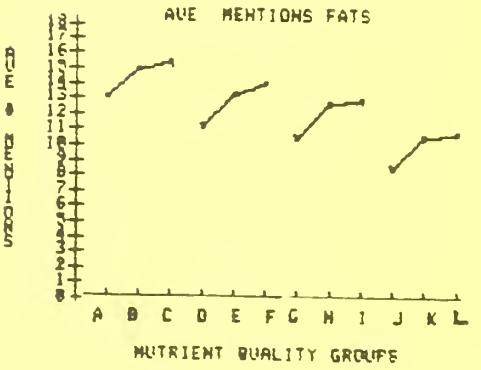


TABLE 7 Distribution of Intakes by Mentions of Four Food Groups and Nutrient Quality Groups (N=21,579)

PERCENT DISTRIBUTION OF RESPONDENTS BY THREE DAYS' TOTAL SERVINGS FOR FOUR FOOD GROUPS* AND TWELVE NUTRIENT QUALITY CATEGORIES (N=21,579)

MENTIONS FOR EACH OF FOUR FOOD GROUPS*	NUTRIENT QUALITY CATEGORIES											TOTAL	
	A	B	C	D	E	F	G	H	I	J	K	L PERCENT	NUMBER
≥6, ≥6, ≥12, ≥12	17.1	55.6	14.2	2.0	5.2	1.2	1.1	.9	.3	.8	1.2	.3 100.0	648
≥5, ≥5, ≥10, ≥10	15.2	45.7	16.9	3.1	8.2	3.0	.7	2.4	1.3	.9	1.9	.7 100.0	1381
≥4, ≥4, ≥ 8, ≥ 8	11.9	37.0	16.3	3.1	9.0	5.1	2.2	4.6	2.1	1.7	4.2	2.8 100.0	3065
≥3, ≥3, ≥6, ≥6	9.6	28.9	14.2	4.2	9.7	6.1	2.7	5.6	3.9	3.5	7.0	4.7 100.0	5038
≤3, ≤3, ≤6, ≤6	4.6	11.8	9.2	3.2	7.3	8.0	2.7	5.9	6.1	9.1	16.5	15.8 100.0	11447
TOTAL PERCENT	7.9	22.8	12.0	3.4	8.1	6.6	2.4	5.3	4.5	6.0	11.1	9.9 100.0	21579
NUMBER	1696	4926	2588	732	1745	1425	524	1139	972	1284	2402	2146 21579	

PERCENT DISTRIBUTION OF RESPONDENTS BY THREE DAYS' TOTAL SERVINGS FOR FOUR FOOD GROUPS* AND TWELVE NUTRIENT QUALITY CATEGORIES (N=21,579)

MENTIONS FOR EACH OF FOUR FOOD GROUPS*	NUTRIENT QUALITY CATEGORIES											TOTAL	
	A	B	C	D	E	F	G	H	I	J	K	L PERCENT	NUMBER
≥6, ≥6, ≥12, ≥12	6.5	7.3	3.6	1.8	1.9	.6	1.3	.5	.2	.4	.3	.1 3.0	648
≥5, ≥5, ≥10, ≥10	12.4	12.8	9.0	5.9	6.5	2.9	1.9	2.9	1.9	1.0	1.1	.5 6.4	1381
≥4, ≥4, ≥8, ≥8	21.5	23.0	19.3	13.1	15.8	10.9	12.6	12.5	6.6	4.1	5.3	4.1 14.2	3065
≥3, ≥3, ≥6, ≥6	28.4	29.5	27.6	28.7	27.9	21.7	26.0	24.7	20.1	13.6	14.8	11.1 23.3	5038
≤3, ≤3, ≤6, ≤6	31.1	27.3	40.5	50.5	47.9	63.9	58.2	59.4	71.3	80.9	78.5	84.2 53.0	11447
TOTAL PERCENT	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0 100.0	21579
NUMBER	1696	4926	2588	732	1745	1425	524	1139	972	1284	2402	2146 21579	

* FOOD GROUPS: 1-MILK GROUP
2-MEAT GROUP
3-FRUITS & VEGETABLES
4-GRAINS

TALK by John S. Akin, Jeff S. Bass, David K. Guilkey, Pamela S. Haines, and Barry M. Popkin (presentor) University of North Carolina at Chapel Hill at the 1983 Agricultural Outlook Conference, Session 25, Washington, D.C.

For Release: December 1, 1982

During the late 1960s and 1970s, the issues of poverty and undernutrition claimed national prominence. While nutritional imbalances and deficiencies were clearly not limited to low income persons, a disproportionate number of the low income were undernourished. A large proportion of the poor were children of school age. In order to address the nutrition and poverty issues, new federal programs were developed and adjustments were made in existing federally sponsored programs. As examples, the National School Lunch Program (NSLP), in operation since 1946, was authorized to increase federal per-meal reimbursements so that free and reduced-price meals could be served to greater numbers of poor children. The School Breakfast Program (SBP), originally a pilot program targeted to children in schools in low income districts, was made a permanent program and funding was made available to all schools that chose to offer the breakfast program. Until recently, however, no study based on a nationally representative sample of children has assessed how participation in the NSLP and the SBP affects the nutrient intake of school age children. In a series of studies, we have examined the ways in which school lunch and school breakfast participation affect the nutrient intakes of children at all income levels.

Nutritional Status of School Age Children

To determine whether public expenditures for school feeding programs can be justified on nutritional grounds, it is important to review the nature and extent of nutritional imbalances and undernutrition among school age children. Several national surveys have provided dietary, clinical, and/or biochemical measurements useful for assessing nutritional status. These include the 1977-78 Nationwide Food Consumption Survey (NFCS) and the Health and Nutrition Examination Survey of 1971-74 (HANES I). As table 1 shows, based on the HANES I data, serious indications of nutritional deficiencies--the presence of clinical symptoms--are generally present only for a small proportion of the school age population. Teenagers below the poverty level, however, are the exception. Between 6 and 19% of all poor teenagers were found to have clinical symptoms of calcium and niacin deficiency. In general, among HANES I children, nutrient deficiencies were more prevalent among the children from low income families, among blacks, and among teenagers. Milder subclinical deficits are widespread in the population. Deficiencies such as

these may have long term effects, ranging from limiting of growth (particularly for the adolescent) and impairing of the quality of dental health, to contributing to limited attention spans.

Table 1. Prevalence of clinical symptoms indicative of nutrient deficiency (Percentage of children in the category suffering clinical symptoms)

	6-12 years		12-18 years	
	Below Poverty	Above Poverty	Below Poverty	Above Poverty
Calcium				
whites	5.7%	4.5%	14.8%	12.5%
blacks	7.6	6.4	18.9	12.4
Vitamin A				
whites	7.9	5.9	10.6	6.5
blacks	14.7	2.6	7.6	5.1
Vitamin C				
whites	3.6	4.5	29.1	9.0
blacks	7.8	1.0	27.8	19.2
Niacin				
whites	4.2	3.9	6.1	7.2
blacks	2.8	11.0	18.6	10.4

Nutrient intake studies of school age children generally support the findings of the clinical studies. Nutrients most likely to be consumed in inadequate quantities are energy, iron, calcium, riboflavin, vitamin B6, and magnesium. Although average intakes of Vitamin A and Vitamin C usually exceed the Recommended Dietary Allowance (RDA), excessive consumption by some students obscures the very low intakes of others. Among children of ages 6 to 11 in our NFCS samples, one quarter or more consumed less than two-thirds of the age-adjusted RDAs for energy, Vitamin B6, and Vitamin A. Even more of the teens had poor diets. One quarter or more of all sample teenagers ages 12 to 18 consumed less than 60 percent of the RDA for Vitamin B6, Vitamin A, iron, and calcium. The diets of teenage girls were consistently lowest in their nutrient adequacy ratings.

Presence of clinical symptoms indicative of nutrient deficiencies and a widespread underconsumption of selected nutrients within the school age population indicate that a public health problem does exist. Although it is currently popular to attempt to link child health practices, such as excessive consumption of energy, saturated fat, cholesterol, and sodium, to the probability of developing any

number of adult chronic disease states, it is important to emphasize that nutrient underconsumption may tend to have important and immediate developmental and behavioral consequences.

Research Framework

We have conducted a series of analyses to determine the ways participation in the NSLP and SBP affects the nutrition of school age children (1). Results discussed below are based on multivariate, statistically controlled regression analyses. The samples consist of school age children selected from the individual files of the Basic and Low Income samples of the Nationwide Food Consumption Survey (NFCS), 1977-78, and the Survey of Food Consumption in Low-Income Households, 1979-80. In each study, individual average one-day nutrient intakes are the primary measures we compare among children. In general, results presented here are for children in the Basic Sample of the 1977-78 NFCS. We statistically control for school meal program participation and other factors thought to affect levels of nutrient consumption among children. These control factors include demographic, socioeconomic, and individual child characteristics--such as age, sex, ethnic background, and anthropometric measures--all of which may influence food consumption patterns. The analyses are presented for two groups of children, those 6 to 11 years old and those 12 to 18 years old.

School Lunch Participation

Children 6 to 11 years old. School Lunch Program participation makes an important contribution to the diets of children of all ages. When we control for all other factors thought to influence consumption, so that the only difference between students is school lunch participation, younger children who participate in the school lunch program consume more of every nutrient during a 24-hour period than do children who do not participate. The magnitude of the impact for each of the younger chldren can be quite sizable. For example, as shown in Table 2, for children of all incomes, school lunch participants consume about 6 percent more of their energy requirement than do nonparticipants who eat other kinds of lunch. Participants consume about 20 percent more of the RDAs for calcium, iron, and Vitamin B6, and about 25 percent more of the Vitamin C and riboflavin (not shown) RDAs. School lunch participants also consume 67 percent more of the Vitamin A RDA than do children who eat other kinds of lunches, such as a la carte meals or brown bag lunches from home. Over the same one-day time period, children who eat other, non school lunches do not seem to consume any more calcium, iron, or Vitamin B6 than do children who eat no lunch. Therefore, school lunch participation is particularly important for children ages 6 to 11. Not only does participation increase intakes, but three of these nutrients--energy, Vitamin A, and Vitamin B6--have been identified as particular nutritional problems for younger children.

Table 2. Selected School Lunch Program Benefits, as a Percentage of the Recommended Dietary Allowance, Children Ages 6-11, NFCS Basic Sample, 1977-78

	Benefits relative to children eating other kinds of lunches*	Benefits relative to children who eat no lunch
Energy	+6%	+15%
Calcium	+19	+12
Vitamin B6	+21	+23
Iron	+19	+20
Vitamin A	+70	+28
Vitamin C	+21	+67

* For example, over a 24-hour period, children who participate in the school lunch program consume 6 percent more of the energy RDA than do children who eat other kinds of lunches and 15 percent more than children who eat no lunch.

Adolescents ages 12 to 18 years. Teenagers also benefit substantially from School Lunch Program participation. Over a day's time, when all other factors affecting consumption are accounted for, school lunch participants consume more of all nutrients than do nonparticipants. As seen in Table 3, nutrients frequently consumed in inadequate quantities by teenagers, teenage school lunch participants consume about 7 percent more of the niacin RDA (2) and 15 percent more of the RDAs for calcium and Vitamin B6. Similarly, older participants show the benefit of school lunch consumption with intakes of riboflavin and Vitamin A which are 24 to 44 percent of the RDA higher than the intakes of nonparticipants.

Because clinical symptoms of calcium and Vitamin A deficiencies have been noted among teenagers, and dietary intakes of calcium, riboflavin, Vitamin A, and Vitamin B6 are particularly low for a sizable proportion of this population, school lunch participation obviously fills important nutritional gaps for this group.

Table 3. Selected School Lunch Program Benefits as a Percentage of the Recommended Dietary Allowance, Teenagers Ages 11-14, NFCS Basic Sample

	Benefits relative to children eating other kinds of lunches		Benefits relative to children who eat no lunch	
	Males	Females	Males	Females
Energy	+8%	+10%	+18%	+23%
Calcium	+16	+17	+26	+26
Niacin	+7	+10	+18	+23
Riboflavin	+24	+30	+32	+39
Vitamin B6	+13	+13	+19	+20
Iron	+7	+7	+15	+15
Vitamin A	+35	+44	+30	+38
Vitamin C	+11	+11	+36	+36

Low Income Children. When we look at the impact of school lunch participation for children at differing levels of income, it becomes obvious that the school lunch program makes a particular difference for children of poorer households. For example, young school lunch participants in households with incomes below the poverty index not only consume more energy than do similar children who eat other kinds of lunches, but the size of energy benefit is twice as large (10 percent of the RDA) as the energy impact for similar participants from households with higher incomes (5 percent of the RDA). Similarly, poor, younger NSLP participants consume approximately 22 percent more of the Vitamin B6 RDA than do children eating other types of lunches.

The nutrient intake benefits of school lunch participation are even greater for low income teenagers than for their younger counterparts. Table 4 presents differences between teens in high and low income households. Low income teenage school lunch participants consume approximately 728 kilocalories per day more than do poor adolescents who eat other types of lunches. This is about one-third of the teenage girls' energy requirement and about one-fourth of the male RDA. (In contrast, at higher income levels the energy impact is only 169 kilocalories.) From our research, it is impossible to determine if this sizable energy impact contributes to overweight among low income teenagers, or even if it can be said with certainty that school lunch participation provides food and nutrients where none

would have been consumed in the absence of the program. It is clear, however, that overall diets of the poorest teenagers are greatly helped by school lunch participation. Low income teenage participants consume over 40 percent more of the Vitamin B6 RDA than do nonparticipants--a finding of particular nutritional significance among teenage girls who traditionally have very low intakes of this nutrient. Similarly, low income teenage school lunch participants consume nearly 30 percent more of the iron RDA than do nonparticipants, in contrast to a 6 percent benefit for teen participants in higher income households. Since iron deficiency is a major public health problem, particularly among adolescents, these nutrient benefits can make important health contributions. Vitamin A benefits of school lunch participation are also significant and impressive. Higher income students add about 20 percent of the Vitamin A RDA when they consume school lunch. For low income teens, participants consume nearly 80 to 95 percent more of the RDA than do other poor teenagers who eat other forms of lunch.

Table 4. Selected School Lunch Program Benefits, as a Percentage of the Recommended Dietary Allowance, NFCS Basic Sample, 1977-78

	Poor Teenagers*	Higher Income Teenagers*
Females		
Energy	33%*	8%
Vitamin B6	40	11
Iron	28	6
Vitamin A	97	25
Males		
Energy	27%	6%
Vitamin B6	40	11
Iron	28	6
Vitamin A	77	20

* These results compare the 24 hour intakes of school lunch participants to the intake of similar income teenagers who consume other kinds of lunches.

School Breakfast Participation

Children 6 to 11 years old. Children who consume school breakfast also have diets superior to those who eat other kinds of breakfast, but the relative nutritional impacts are not as consistently significant as those between school lunch participants and those eating other kinds of lunches. Over a day's time, younger children who participate in the School Breakfast Program consume more

Vitamin B12, riboflavin, and Vitamin A than do children who eat other forms of breakfast.

Although we have no scientific research results to support this contention, it is almost certain that the availability of a School Breakfast Program increases the frequency with which some children eat a breakfast. For the younger child who eats a SBP breakfast, but would not have eaten a breakfast in the absence of the program, the nutritional benefits are important. Breakfast consumption increases the day's nutrient intake of every nutrient, relative to intakes of the group of younger children who eat no breakfast. For energy, the impact is nearly one-quarter of the RDA. The Vitamin B6 and iron intakes of breakfast eaters are one-third of the requirements greater than those of nonbreakfast eaters. Vitamin C intakes are increased by nearly the size of the entire Vitamin C RDA. The calcium consumption impact approaches 40 to 45 percent of the calcium RDA.

Clearly, Vitamin A, energy, Vitamin B6, Vitamin C, and calcium are nutrients underconsumed by large portions of the preteen population. For children who normally eat other types of breakfast, of the above nutrients, School Breakfast Program participation appears to contribute to improved Vitamin A nutriture. For children who eat a SBP breakfast where breakfast would not have been eaten otherwise, the nutritional implications of participation are much more important.

Table 5. Selected School Breakfast Program Results, as a Percentage of the Recommended Dietary Allowance NFCS Basic Sample, 1977-78

	Benefits relative to children eating other kinds of breakfast	Benefits relative to children who eat no breakfast
Younger Children		
Energy	3%*	23%
Calcium	28	72
Vitamin B6	31	72
Iron	31	66
Vitamin A	348	380
Vitamin C	38	127
Older Children		
Energy	15%	35%
Calcium	44	75
Vitamin B6	15	38
Iron	23	42
Vitamin A	21	16(1)
Vitamin C	32	91

* These percentages are calculated from results with various levels of statistical signficance.

Adolescents ages 12 to 18 years. Over a one-day period, when we control for other factors affecting teen nutrient intake, adolescent School Breakfast Program participants consume more protein, calcium, riboflavin, magnesium, thiamin, and iron than do teens eating other kinds of breakfasts. The calcium (45 percent of the RDA), riboflavin (65 percent of the female RDA and about 50 percent of the male RDA), and iron (nearly 25 percent of the RDA) intake impacts have particular nutritional status importance. When one considers that these differences are for teens who differ only in that one eats a school breakfast and one eats a nonschool breakfast, the magnitudes of the effects are even more impressive.

As with the younger age group, if a teenager consumes a school breakfast, but would not have eaten breakfast were the program not available, the nutritional implications are even more comprehensive. Relative to teenagers who do not consume breakfast, School Breakfast Program teenage participants consume more of every nutrient except Vitamin B12 and Vitamin A. For this group, who may be encouraged by the presence of the SBP to eat breakfast, daily riboflavin intakes are nearly 100 percent of the RDA greater; with calcium intakes, 75 percent; Vitamin C intakes, at least 50 percent; iron intakes, 40 percent; Vitamin B6 intakes, 35 percent; and niacin intakes, 30 percent greater than for comparable teens who do not eat any breakfast. While the growth and development implications of these additions are important for both sexes, given the larger proportion of teenage females with inadequate dietary intakes, these impacts are particularly significant for the females.

Low income children. As with school lunch participation, the nutrient intake impacts of school breakfast participation are greatest among children from low income households. As examples, among low income children ages 6 to 11, participants consume over 10 percent more of the energy RDA than do children eating other kinds of breakfasts. Similarly, low income SBP participants consume 25 percent more of the RDA for calcium, 30 percent of the riboflavin RDA, 15 percent of the Vitamin B6 RDA, and 85 percent more of the Vitamin C RDA, relative to daily intakes of children who eat other types of breakfast.

As is the case with higher income students, daily nutrient intakes are augmented for low income younger students who eat a school breakfast but would not eat breakfast if the program were unavailable. Adolescents from poorer households also receive substantial nutritional benefits from School Breakfast Program participation. Relative to intakes of other low income teens who consume other kinds of breakfasts, over a one-day period, SBP participants consume substantially more calcium, Vitamin B6, riboflavin, and Vitamin A. When availability of a SBP encourages a low income teen to eat a breakfast, daily intakes of every nutrient increase. Teens in this low income category consume larger quantities of Vitamin B6, Vitamin A, and Vitamin C relative to higher income teens.

Nutrition Implications

Participation in the School Lunch and School Breakfast Programs results in increased nutrient intakes. These increases are particularly important for nutrients such as energy, calcium, riboflavin, iron, Vitamin B6, and Vitamin A, for which we have either clinical evidence of deficiency within the school age population or dietary survey evidence indicating consumption below recommended levels by significant segments of the school age population. However, the nutritional effects of school meals participation can also be judged by determining how participation affects the overall diet quality, or the nutritional balance of a diet. Since each nutrient has a metabolic function, independent of intakes of other nutrients, consistent low intake of even one nutrient can have deleterious health effects.

In our analyses, we have identified factors which influence the level of nutrient consumption for the nutrient considered least adequate for each surveyed child in terms of the percentage of the RDA. This RDA for the least adequate nutrient is termed the minimum nutrient adequacy ratio. Selected results of this analysis are presented in Table 6. Across all samples and for all ages, participation in a school lunch program raises the level of the minimum nutrient adequacy ratio by 14 to 17 percentage points, relative to that of students who eat other types of lunches. In general, consumption of a nonschool lunch is not associated with a significant change in the minimum nutrient adequacy ratio. Only for adolescents in the Basic sample is nonschool lunch consumption associated with any increase in the level of consumption of the most deficient nutrient.

School Breakfast Program participation is even more important in helping children to achieve balanced diets. Within our Basic sample, the level of the minimum nutrient adequacy ratio is approximately 30 percent higher for SBP participants than for children who eat other types of breakfasts. If, in fact, availability of a school breakfast program encourages school age children to eat breakfast who normally would not, the nutritional benefits are even more striking. Among children of all incomes, the minimum nutrient adequacy ratio of SBP participants is approximately 50 percent higher than that of children who do not eat breakfast. This result is found for both age groups. By any interpretation, School Breakfast Program participation and School Lunch Program participation improve the nutrient balance of diets of children of school age. Not only does school meal program participation augment intakes of many individual nutients, but such participation increases nutrient intakes for those nutrients most in need of supplementation--nutrients normally consumed in inadequate supply by school age children.

Table 6. Impact of School Meals Program Participation on Levels of Minimum Nutrient Adequacy Ratio

	Younger Children	Older Children
SBP participation benefits relative to children eating other types of breakfast	30%*	34%
SBP participation benefits relative to children eating no breakfast	58%	52%
NSLP participation benefits relative to children eating other types of lunch	17%	14%
NSLP participation benefits relative to children eating no lunch	19%	21%

* For example, the least adequately consumed nutrient (Minimum Nutrient Adequacy Ratio) is 30 percent of the RDA greater for School Breakfast Program participants than for children who eat other kinds of breakfasts.

Summary and Implications

Participation in the School Breakfast and School Lunch Programs is associated with improvements in nutrient intakes frequently found to be underconsumed by children of school age. Participation is particularly important for low income children of all ages, for whom the nutritional benefits are even greater than for children in higher income households.

If one evaluates the effectiveness of the school meals program on the basis of improvements in the dietary quality of participating children relative to children who are not participating--particularly for low income children--our analysis provides strong evidence that participation is associated with increases in nutrient intakes for some of the most needed nutrients. For younger children, particular needs for increases in energy, Vitamin B6, and Vitamin A intakes are met by program participation. Among teenagers, participation helps to fill several nutritional gaps--notably for calcium, Vitamin B6, Vitamin A, and iron. Where program availability results in a child's consuming a meal where a meal would otherwise not have been consumed, a substantial nutritional benefit is seen. This benefit is particularly evident where School Breakfast Program availability encourages consumption of breakfast. Strong evidence that participation in either the NSLP or SBP helps to improve the nutritional balance of diets of school age children is provided by the

fact that the level of consumption for the least adequately consumed nutrient is signficantly increased.

While relatively more significant individual nutritional benefits are realized by low income children, children in higher income levels also receive important benefits. Because some children at all income levels underconsume selected nutrients, program participation helps to fill the needs of all groups of children. Serious nutritional problems exist among segments of the adolescent population. That adolescent participants particularly benefit from the school meals programs is added evidence that school meals programs are a viable and effective means for improving the health of the nation's children.

Footnotes

1. For complete results, the interested reader may refer to:

   Popkin, B., Akin, J., Haines, P., MacDonald, M. and D. Spicer (1980) "Nutrition Program Options for Maternal and Child Health." Institute for Research on Poverty, University of Wisconsin, Madison, Special Report Series No. SR28.

   Akin, J., Guilkey, D., Haines, P., and B. Popkin (1982) "The Nutrient Impact of School Feeding: A. The National School Breakfast Program, B. The National School Breakfast and Lunch Program Interactions." Completed for USDA Contract #53-3244-9-191.

   Akin, J., Guilkey, D., and B. Popkin (1982) "Impact of the School Lunch Program on Nutrient Intake: A Switching Regression Analysis." (Under final journal review).

   Akin, J., Guilkey, D., Haines, P., and B. Popkin (1982) "The Impact of the School Lunch Program on Nutrient Intakes." School Food Service Research Review (in press for 1983 winter edition).

2. This RDA refers to niacin and we have data only for preformed niacin.

NUTRITIONAL AND ECONOMIC ASPECTS OF CONVENIENCE AND NONCONVENIENCE FOODS

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1983 Agricultural Outlook Conference, Session #25
Washington, D.C.

For Release: Wednesday, December 1, 1982

INTRODUCTION

The use of convenience foods allows consumers to transfer food preparation from the kitchen to the processor. During the past few decades, a myriad of convenience foods, particularly canned foods, frozen items, and mixes, have been introduced into the marketplace. In 1976, expenditures on processed products amounted to nearly $50 billion. Of this total, $8.6 billion were spent on ready-to-cook items, $7.6 billion on ready-to-heat items, and $33.3 billion on ready-to-eat products.[1]

A paucity of economic and nutritional information exists regarding convenience and nonconvenience foods used by U.S. households. In an attempt to add to this sparse store of knowledge, research has been conducted by an interdisciplinary team composed of nutritionists and agricultural economists. The purposes of this research were: (1) to develop operational definitions of convenience and nonconvenience foods, (2) to determine nutrient contributions of the various food classes used by U.S. households, and (3) to ascertain key determinants of convenience and nonconvenience food use according to their money value and share of food dollar.

DATA SOURCE

The source of the data was the household phase of the 1977-78 Nationwide Food Consumption Survey (NFCS), a stratified probability sample of approximately 15,000 households in the 48 conterminous states. This information refers to food used in the household in a 7-day period and includes not only what was eaten by household members and guests but also food that was discarded or eaten by pets. The data, therefore, should not be interpreted as representative of food actually eaten.

CLASSIFICATION SCHEME

Each food code in the household portion of the NFCS was assigned a convenience or nonconvenience status according to the following definitions:

1. Basic convenience - foods where processing is more related to a preservation method than ease of preparation; foods with a single or limited number of ingredients; foods with time or energy inputs but not culinary expertise built in.
2. Complex convenience - foods which have a high level of time saving and/or energy inputs and culinary expertise built in; multi-ingredient prepared mixtures.

[1] Livingston, G.E. and C.M. Chang, "Commercial Production of Ready-To-Serve Food in the United States", In How Ready Are Ready-To-Serve Foods? K. Paulus, Editor, Basel: S. Karger, 1978, pp. 35-48.

3. Manufactured convenience - foods which have no home-prepared counterpart.
4. Nonconvenience - fresh (unprocessed) foods; home frozen or home canned or home preserved food items; and ingredient foods. Ingredient foods are processed food products used in food preparation, usually in the most basic form in their category, that either cannot be or are not commonly prepared in the home.

These definitions were based, in part, on work by Traub and Odland[2]. Examples of foods in each of the four categories are shown in Table 1.

Of more than 4000 food codes used in the survey, 32.7 percent were basic convenience, 28.8 percent were complex convenience, 3.5 percent were manufactured convenience, and 35.0 percent were nonconvenience. An individual food code referred to a single food item in some cases and to clusters of similar foods in other instances. Therefore, the distribution of food codes does not reflect precisely the proportion of foods in the classes.

Convenience and nonconvenience foods were ranked on the number of households which reported using them during the survey week. The top 10 convenience food items were (in descending order): white bread (enriched) cola soft drinks, saltine-type crackers, peanut butter, meat frankfurters, frozen orange juice concentrate, bologna, catsup, processed American cheese, and powdered instant coffee. The top 10 most frequently reported nonconvenience foods (in order) were: granulated white sugar, fresh whole white potatoes, whole milk, fresh lettuce (crisphead varieties), fresh large eggs, fresh apples, fresh tomatoes, fresh onions, stick margarine, and fresh bananas.

NUTRIENT CONTRIBUTIONS OF CONVENIENCE AND NONCONVENIENCE FOOD CLASSES

Mean food energy and nutrients per nutrition unit per day were computed to determine the nutrient contribution of each convenience and nonconvenience class of foods used by the households. The number of nutrition units in a household was the sum of the recommended dietary allowance (RDA) for that nutrient for persons eating in the household (adjusted for meals eaten away from home) divided by the RDA for the adult male.

Contributions of food energy (kilocalories) by the convenience and nonconvenience classes were: 15 percent from basic convenience, 23 percent from complex convenience, 7 percent from manufactured convenience, and 55 percent from nonconvenience foods (Table 2). Proportions of nutrients provided by nonconvenience foods were somewhat comparable (50-65 percent) to the proportion of kilocalories, except that 42 percent of carbohydrate and thiamin and 71 percent of vitamin B_{12} were from this food class.

The distribution of nutrients provided by the convenience classes was variable. For example, basic convenience foods on the average provided 25 percent of the vitamin A and 42 percent of the vitamin C; complex convenience food contributions of these vitamins were only 11 and three percent, respectively. Manufactured convenience foods represented a smaller proportion of food items than the other food classes and thus lower percentages of most nutrients in the foods used by the households. However, manufactured convenience foods provided as much vitamin B_6 as that provided by

[2]Traub, L. G. and D. Odland, "Convenience Foods and Home-Prepared Foods: Comparative Costs, Yield, and Quality," Agricultural Economic Report #429, USDA, Economics, Statistics, and Cooperative Service (August 1979).

Table 1. SELECTED FOODS IN CONVENIENCE AND NONCONVENIENCE CLASSES

Basic Convenience	Complex Convenience	Manufactured Convenience	Nonconvenience
Processed cheese	Cheese balls	Imitation cheese spreads	Natural cheeses
Dry milk and canned condensed and evaporated milk	Frozen desserts containing milk	Soy base infant formula	Fluid whole and skim milk
Soft tub margarine	Salad dressings		Cooking oils; stick margarine; butter
Quick cooking and instant cereals	Biscuit mix	Ready-to-eat breakfast cereals	Regular cooking oatmeal
Self-rising flour and cornmeal	Pancake, cake, and cookie mixes	Saltine and soda crackers	Flour; cornmeal; rice, macaroni
Dry bread crumbs	Ready-to-eat and commercially frozen breads, biscuits, pies, cakes, doughnuts, and cookies	Breakfast toaster pastry; breakfast bars	Home frozen pies, cakes, cookies, and waffles
Commercially canned and frozen meat, poultry and fish	Hot dogs, bologna and other luncheon meats; commercially frozen breaded fish	Canned meal replacement or supplement	Fresh eggs; fresh and home frozen meat, poultry, and fish
Whipped honey	Commercially prepared jam, jelly; chocolate, coconut and nut candies	Gum drops; jelly beans; dietetic candy	Brown and white sugar; honey; home preserved jam and jelly
Commercially prepared french fries	Potato chips		Cooked, fresh, and home canned potatoes
Commercially frozen and canned vegetables and vegetable juices	Commercially frozen vegetables with sauce		Fresh, home canned, and home frozen vegetables; dried peas and beans
Commercially canned and frozen fruits and fruit juices	Commercially canned fruit pie filling		Fresh, home frozen, and home canned fruits
Powdered instant coffee and tea	Beer and wine	Gin and rum	Bean or ground coffee and loose leaf or bag tea
Commercially canned ades, punches, drinks, and fruit nectar	Root beer	Soft drinks	Home canned fruit nectar
Olives	Commercially prepared pickles, catsup, relishes		Home prepared pickles and relishes
Shelled nuts; peanut butter			Nuts, in shell
	Ready-to-eat, commercially canned and frozen entrees and side dishes; commercially canned, frozen, and dehydrated soups		Home frozen and home canned mixtures including soups

Table 2. MEAN NUTRIENT LEVEL PER HOUSEHOLD MEMBER[a] PER DAY FOR CONVENIENCE AND NONCONVENIENCE FOOD CLASSES

Nutrient	Basic convenience		Complex convenience		Manufactured convenience		Nonconvenience	
	Mean	%	Mean	%	Mean	%	Mean	%
Food energy (kilocalories)	576 (391)[b]	15	889 (501)	23	278 (231)	7	2112 (1041)	55
Protein (g)	21.1 (18.8)	16	20.9 (13.0)	16	3.9 (3.9)	3	82.6 (38.6)	64
Fat (g)	19.4 (17.9)	13	29.6 (20.4)	20	3.6 (4.7)	2	96.5 (53.4)	65
Carbohydrate (g)	55.6 (44.7)	17	97.6 (54.8)	28	43.0 (36.2)	13	140.2 (44.2)	42
Calcium (mg)	195.3 (211.0)	18	182.0 (117.0)	17	31.6 (39.5)	3	661.6 (393.3)	62
Iron (mg)	2.70 (3.28)	17	3.13 (2.09)	19	2.02 (2.22)	12	8.44 (5.25)	52
Magnesium (mg)	106.7 (78.8)	21	81.9 (57.9)	16	33.9 (43.7)	7	278.2 (141.7)	56
Phosphorus (mg)	346.7 (294.3)	19	273.5 (195.8)	16	91.2 (101.4)	5	1080.8 (513.0)	60
Vitamin A (I.U.)	1655 (1498)	25	726 (807)	11	806 (914)	12	3507 (2320)	52
Thiamin (mg)	0.20 (0.28)	14	0.35 (0.31)	24	0.29 (0.40)	20	0.61 (0.53)	42
Riboflavin (mg)	0.19 (0.36)	9	0.33 (0.29)	15	0.32 (0.45)	15	1.31 (0.86)	61
Preformed niacin (mg)	6.60 (5.73)	19	6.37 (4.13)	18	4.43 (5.13)	13	17.19 (10.41)	50
Vitamin B_6 (mg)	0.17 (0.23)	11	0.11 (0.18)	7	0.29 (0.41)	18	1.04 (0.60)	65
Vitamin B_{12} (mcg)	0.88 (3.31)	14	0.62 (1.06)	10	0.35 (0.80	5	4.64 (6.27)	71
Vitamin C (mg)	64.3 (64.3)	42	5.3 (7.7)	3	7.2 (10.4)	5	75.2 (65.2)	50

[a]Houshold member is "nutrition unit" defined as the sum of the RDA for that nutrient for persons eating in the household (adjusted for meals eaten away from home) divided by the RDA for the adult male; fat and carbohydrate are based on 21-meal equivalents

[b]Standard deviation in parentheses

the other two convenience classes. This class also contributed significant proportions of other B vitamins - thiamin, riboflavin, and preformed niacin.

Pearson product-moment correlation coefficients indicated that, with the exception of calcium, vitamin A, and carbohydrate, nutrient level per nutrition unit was positively associated with the share of the food dollar allocated to nonconvenience foods (Table 3). Although in most cases statistically significant, the magnitudes of the respective relations were relatively small, ranging from 0.0198 for magnesium to 0.1141 for iron. With some exceptions, nutrient level per nutrition unit was negatively associated with the share of the food dollar allocated to convenience classes. However, similar to the relations for nonconvenience foods, the correlation coefficients, although generally statistically significant, were comparatively small.

Nutrient Densities and Nutrients Per Dollar

Mean nutrient densities and mean nutrients per dollar of convenience and nonconvenience classes of foods used by households were computed (Tables 4 and 5). Nutrient density was defined as nutrients per 1,000 kilocalories. Nutrients per dollar were computed as the ratio of each nutrient in the food classes used by households to the dollar value of those food classes. Tests of hypotheses concerning the equality of mean nutrient densities and mean nutrients per dollar for the convenience and nonconvenience classes were made using one-way analysis of variance. Tests of all possible pairwise differences for each nutrient were made using Duncan's Multiple Range Test. To compensate for the substantial sample sizes, the signifcance level chosen was 0.01. With a few exceptions, pairwise differences in mean nutrient densities and mean nutrients per dollar among the four food classes were statistically different for each nutrient.

The belief held by many consumers that processed foods are expensive sources of low levels of nutrients was not confirmed by nutrient densities and nutrients per dollar. With few exceptions the mean cost of the nutrients was lower for convenience foods than for nonconvenience foods. No single food class was consistently the best source of all nutrients per 1,000 kilocalories. The mix of food items and the prevalence of use of specific foods within the classes contributed, in part, to the nutrient densities of the food classes.

Complex convenience foods provided the most kilocalories per dollar. Fresh and frozen meats and cheese and milk products in the basic convenience and nonconvenience food classes contributed to high protein densities and high levels of protein per dollar. Basic convenience foods also provided a high level of protein per dollar. Fat content of convenience foods was lower than that of nonconvenience foods, perhaps because untrimmed fresh meats and table and cooking fats were classified as nonconvenience items. On the other hand, on a per unit basis fat in the nonconvenience class was less expensive than in the convenience classes.

Carbohydrate density and level of carbohydrate per dollar were higher for the convenience food classes than for the nonconvenience food class. As expected, the chief and least expensive source of energy in the manufactured convenience class was carbohydrate. A large proportion of the foods in this class such as ready-to-eat cereals, candies, and soft drinks, contain low levels of fat and protein and high levels of carbohydrate.

Table 3. PEARSON PRODUCT-MOMENT CORRELATION COEFFICIENTS OF NUTRIENT LEVEL PER HOUSEHOLD MEMBER[a] AND SHARE OF FOOD DOLLAR FOR CONVENIENCE AND NONCONVENIENCE FOOD CLASSES

Nutrient	Basic convenience	Complex convenience	Manufactured convenience	Nonconvenience
Food energy	-0.0479	-0.0152[b]	0.0015[b]	0.0418
Protein	0.0029[b]	-0.0818	-0.0799	0.0869
Fat	-0.1120	-0.0056[b]	-0.0297	0.0913
Carbohydrate	-0.0222	0.0483	0.0558	-0.0415
Calcium	0.0472	-0.0180[b]	-0.0227	-0.0099[b]
Iron	-0.0212[b]	-0.1131	-0.0552	0.1141
Magnesium	0.0272	-0.0430	-0.0213[b]	0.0198[b]
Phosphorus	0.0116[b]	-0.0709	-0.0584	0.0646
Vitamin A	0.1258	-0.0470	0.0105[b]	-0.0568
Thiamin	-0.0699	-0.0418	0.0276	0.0638
Riboflavin	-0.0642	-0.0296	0.0243	0.0530
Preformed niacin	-0.0002[b]	-0.0798	-0.0276	0.0659
Vitamin B_6	-0.0796	-0.0516	0.0325	0.0749
Vitamin B_{12}	0.0072[b]	-0.0246	-0.0261	0.0227
Vitamin C	0.1197	-0.1402	-0.0557	0.0381

[a]Household member is "nutrition unit" defined as the sum of the RDA for that nutrient for persons eating in the household (adjusted for meals eaten away from home) divided by the RDA for the adult male

[b]Not statistically different from zero at the 0.01 level

TABLE 4. MEAN NUTRIENT DENSITIES[a] FOR CONVENIENCE AND NONCONVENIENCE FOOD CLASSES

NUTRIENT	BASIC CONVENIENCE	COMPLEX CONVENIENCE	MANUFACTURED CONVENIENCE	NONCONVENIENCE
Protein (g)	38.23 (20.35)[b]	24.97 (6.18)	15.25 (9.22)	42.56 (11.53)
Fat (g)	40.09[c] (21.73)	40.06[c] (13.49)	15.13 (11.23)	56.35 (12.30)
Carbohydrate (g)	125.70 (56.14)	129.65 (35.67)	196.63 (41.49)	82.21 (31.52)
Calcium (mg)	452.17 (336.93)	274.46 (110.01)	144.42 (121.51)	445.12 (243.75)
Iron (mg)	7.72 (8.37)	5.59 (2.15)	12.06 (8.53)	6.17 (1.85)
Magnesium (mg)	229.13 (201.27)	100.29 (44.44)	138.29 (140.48)	150.53 (58.16)
Phosphorus (mg)	788.79 (345.69)	430.05 (147.22)	452.22 (409.03)	699.23 (204.14)
Vitamin A (I.U.)	3546.40 (4254.39)	867.87 (1087.26)	3417.00 (3429.18)	1923.16 (1405.47)
Thiamin (mg)	0.32 (0.34)	0.40 (0.30)	1.07 (1.12)	0.27 (0.19)
Riboflavin (mg)	0.30 (0.50)	0.36 (0.25)	1.24 (1.31)	0.65 (0.36)
Preformed Niacin (mg)	12.46 (12.10)	7.30 (2.98)	17.28 (14.25)	8.26 (3.61)
Vitamin B_6 (mg)	0.30 (0.34)	0.12 (0.17)	1.22 (1.37)	0.57 (0.24)
Vitamin B_{12} (mcg)	1.83 (6.63)	0.78 (1.44)	1.47 (2.87)	2.66 (3.94)
Vitamin C (mg)	162.43 (172.07)	7.55 (12.55)	34.63 (39.34)	47.06 (42.77)

[a]Nutrient density = nutrients per 1,000 kilocalories
[b]Standard deviation of households in parentheses
[c]Values in the same row not statistically different at the 0.01 level on the basis of Duncan's Multiple Range Test

TABLE 5. MEAN NUTRIENTS PER DOLLAR FOR CONVENIENCE AND NONCONVENIENCE FOOD CLASSES

NUTRIENT	BASIC CONVENIENCE	COMPLEX CONVENIENCE	MANUFACTURED CONVENIENCE	NONCONVENIENCE
Food Energy (kilocalories)	1092.96 (671.76)[a]	1656.03 (621.99)	1471.67 (686.61)	1258.22 (410.21)
Protein (g)	37.23 (21.11)	40.65 (18.12)	23.95 (18.59)	50.80 (13.19)
Fat (g)	45.15 (42.56)	66.28 (33.47)	24.06 (23.93)	70.68 (26.83)
Carbohydrate (g)	138.10 (123.42)	217.06 (109.39)	290.80 (136.58)	106.55 (63.62)
Calcium (mg)	486.31 (506.67)	461.13 (269.52)	203.86 (183.36)	535.33 (304.13)
Iron (mg)	7.67[b] (9.48)	9.35 (5.17)	18.39 (15.59)	7.44[b] (2.50)
Magnesium (mg)	213.42 (122.72)	160.01 (83.46)	201.39 (217.17)	179.11 (60.42)
Phosphorus (mg)	842.94[b] (740.08)	700.99 (372.40)	640.39 (586.39)	840.21[b] (267.34)
Vitamin A (I.U.)	3248.52 (2924.90)	1282.95 (1328.54)	5150.36 (6081.49)	2198.21 (1258.96)
Thiamin (mg)	0.39 (0.64)	0.72 (0.70)	1.68 (1.95)	0.36 (0.27)
Riboflavin (mg)	0.35 (0.61)	0.62 (0.52)	1.92 (2.25)	0.81 (0.47)
Preformed Niacin (mg)	11.82[b] (8.36)	11.99[b] (6.37)	26.75 (25.95)	9.70 (3.38)
Vitamin B_6 (mg)	0.31 (0.36)	0.17 (0.24)	1.87 (2.45)	0.68 (0.28)
Vitamin B_{12} (mcg)	1.51 (4.91)	1.17 (1.98)	2.16 (4.94)	3.16 (4.35)
Vitamin C (mg)	148.16 (141.93)	11.26 (14.09)	52.86[b] (70.38)	52.57[b] (36.82)

[a]Standard deviation in parentheses
[b]Values in same row not statistically different at the 0.01 level on the basis of Duncan's Multiple Range Test

The high nutrient densities and high nutrients per dollar of calcium in nonconvenience and basic convenience foods might be expected, since milk and most cheeses, concentrated sources of calcium, were included in these categories. Manufactured convenience foods provided more iron per thousand kilocalories and per dollar then did the other food classes. Fortification of ready-to-eat cereals may account for this high level. The highest nutrient densities and nutrients per dollar for magnesium were found in the basic convenience class, which included frozen and canned vegetables and fruits. Phosphorus was provided at the highest density and at the least cost in the basic convenience and nonconvenience food classes.

Manufactured convenience foods provided high nutrient densities at relatively low cost for vitamin A, thiamin, riboflavin, preformed niacin, and vitamin B_6, probably a result of fortification of ready-to-eat grain foods. Basic convenience foods also provided a high nutrient density of vitamin A at a low cost. Additionally, nutrient density and nutrients per dollar of vitamin C in the basic convenience food class were substantially higher than in the other food classes. Frozen and canned vegetables and fruits, sources of these vitamins, were in this convenience category. Vitamin B_{12}, found almost exclusively in animal foods, was present at the highest ratio to kilocalories and at the lowest cost in nonconvenience foods.

MONEY VALUE AND SHARE OF FOOD DOLLAR

To enhance the understanding of food purchase patterns in the United States, this research investigated the nature and the magnitude of the influence of various socioeconomic and demographic variates on the money value and the share of the food dollar for convenience and nonconvenience foods. The particular attributes included region, urbanization, income class, household size in terms of 21-meal equivalents, season, origin and race of respondent, occupation of the household head, and age, education, and employment status of the household manager (meal planner). The impact of the various socioeconomic and demographic characteristics is likely to reflect, in part, differences in tastes and preferences, culture, and infrastructure of households. The statistical analysis entailed the use of analysis of covariance -the blending of analysis of variance and regression analysis.

On the average, the money value of all food, nonconvenience foods, and convenience foods used per household was $46.69, $25.69, and $21.00, respectively. The average weekly money value of basic convenience, complex convenience, and manufactured convenience foods was $8.48, $9.04, and $3.48, respectively. On the average, households spent approximately 55 percent of the food dollar on nonconvenience foods, 18 percent on basic convenience foods, 19 percent on complex convenience foods, and 7 percent on manufactured convenience foods, shares similar to percentages of food energy contributed by the respective food classes.

The major determinants of convenience and nonconvenience foods according to share of food dollar are exhibited in Table 6. Generally, white, non-Spanish households located outside the South in central city and suburban areas in which the household manager was less than 34 years of age, employed (part-time or full-time), and at least a high school graduate, allocated significantly larger portions of their food dollar to convenience foods than other types of households. However, Spanish, nonwhite households located in the South in nonmetropolitan areas in which the household manager is at least

TABLE 6. MAJOR DETERMINANTS OF CONVENIENCE AND NONCONVENIENCE FOODS ACCORDING TO SHARE OF FOOD DOLLAR

Determinant	Basic convenience Class	Complex Convenience Class	Manufactured Convenience Class	Nonconvenience Class
Geographical Region	Northeast West	North Central Northeast West	North Central South West	South
Urbanization	Central City	Suburban Central City	Suburban Central City	Nonmetropolitan
Season	Winter Fall Spring	Winter	NSD[a]	Summer
Race	Non-black	White	White	Non-White
Income Class	NSD	NSD	High-income classes (Over $30,000, $20,000 to $29,999)	Low-income classes (Under $5,000 $5,000 to $9,999 $10,000 to $14,999)
Occupation of Household Head	White-collar	Blue-collar	NSD	NSD
Education of Household Manager (Meal Planner)	At least a high school graduate	NSD	At least a high school graduate	Not a high school graduate
Age of Household Manager (Meal Planner)	21 to 34 over 65	Less than 21 21 to 34	Less than 21 21 to 34	Over 65 35 to 64
Employment Status of Household Manager (Meal Planner)	NSD	Employed	Employed	Unemployed
Origin	Non-Spanish	Non-Spanish	NSD	Spanish
Household Size in 21-Meal Equivalents	Yes	NSD	NSD	Yes

[a]No statistically significant difference(s)

35 years of age, unemployed, and not a high school graduate, allocated larger portions of their food dollar to nonconvenience foods than other types of households. Also, households typically expended significantly larger shares of their food dollar on convenience foods in the winter and nonconvenience foods in the summer than in the other seasons. Interestingly, household size and household income had seemingly imperceptible influences on the share of food dollar allocated to convenience foods. But, low-income households and households relatively large in size in terms of 21-meal equivalents generally expended larger shares of their food dollar for nonconvenience foods. With few notable exceptions, the aforementioned results also held with respect to money value of convenience and nonconvenience foods.

Given information on household size in 21-meal equivalents and socioeconomic and demographic characteristics, the estimated statistical models were used to make predictions of weekly money value and share of food dollar of convenience and nonconvenience foods. Various socioeconomic and demographic profiles were constructed to examine behavioral patterns. To illustrate, two scenarios are presented.

Scenario I

Region (South), urbanization (nonmetropolitan), season (summer), race of respondent (Black), income class (under $5,000), occupation of household head (blue-collar), education of household manager (not a high school graduate), age of household manager (35-64), employment status of household manager (unemployed), origin of respondent (Spanish).

Scenario II

Region (Northeast), urbanization (suburban), season (winter), race of respondent (white), income class (over $30,000), occupation of household head (white-collar), education of household manager (high school graduate), age of household manager (21-34), employment status of household manager (part-time or full-time employment), origin of respondent (non-Spanish).

A household with five 21-meal equivalents that fits the specification of the first scenario would spend $35.68 on nonconvenience foods (roughly 59 percent of the food dollar), $9.25 on basic convenience foods (15 percent), $11.53 on complex convenience foods (19 percent), and $4.23 on manufactured convenience foods (approximately 7 percent). On the other hand, households with the same household size that fits the specification of the second scenario would spend $47.04 on nonconvenience foods (51 percent of the food dollar), $17.72 on basic convenience foods (19 percent), $19.44 on complex convenience foods (21 percent), and $7.95 on manufactured convenience foods (approximately 9 percent). The tremendous wealth of detail in the classifications of the socioeconomic and demographic variates permits the construction of many unique profiles. Such profiles are useful for market research programs by the food industry and for planning relevant educational materials for population groups.

SUMMARY

Food items used by households in the 1977-78 Nationwide Food Consumption Survey were classified to reflect the convenience or nonconvenience status of each item: (1) basic convenience, (2) complex convenience, (3) manufactured convenience, and (4) nonconvenience.

Basic convenience and nonconvenience foods provided more protein and calcium per dollar and per 1,000 kilocalories than complex convenience and manufactured convenience foods. The highest level of fat per 1,000 kilocalories was present in nonconvenience foods, the class which included untrimmed fresh meats, most milk and cheese products, and table and cooking fats. As the share of the food dollar spent for convenience foods increased, there was an associated small decrease in the nutrient level per nutrition unit for food energy and all nutrients except calcium, vitamin A, and carbohydrate.

Approximately 55 percent of the dollar for food at home was spent on nonconvenience foods, 18 percent on basic convenience foods, 19 percent on complex convenience foods, and 7 percent on manufactured convenience foods. In general, white, non-Spanish, households, located outside the South in central city and suburban areas, in which the meal planner was less than 34 years of age, employed, and at least a high school graduate allocated larger portions of their food dollar to convenience foods than did other households.

HEDGING STRATEGIES AND FARM MARKETING AND FINANCIAL RISKS

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1983 Agricultural Outlook Conference, Session #27

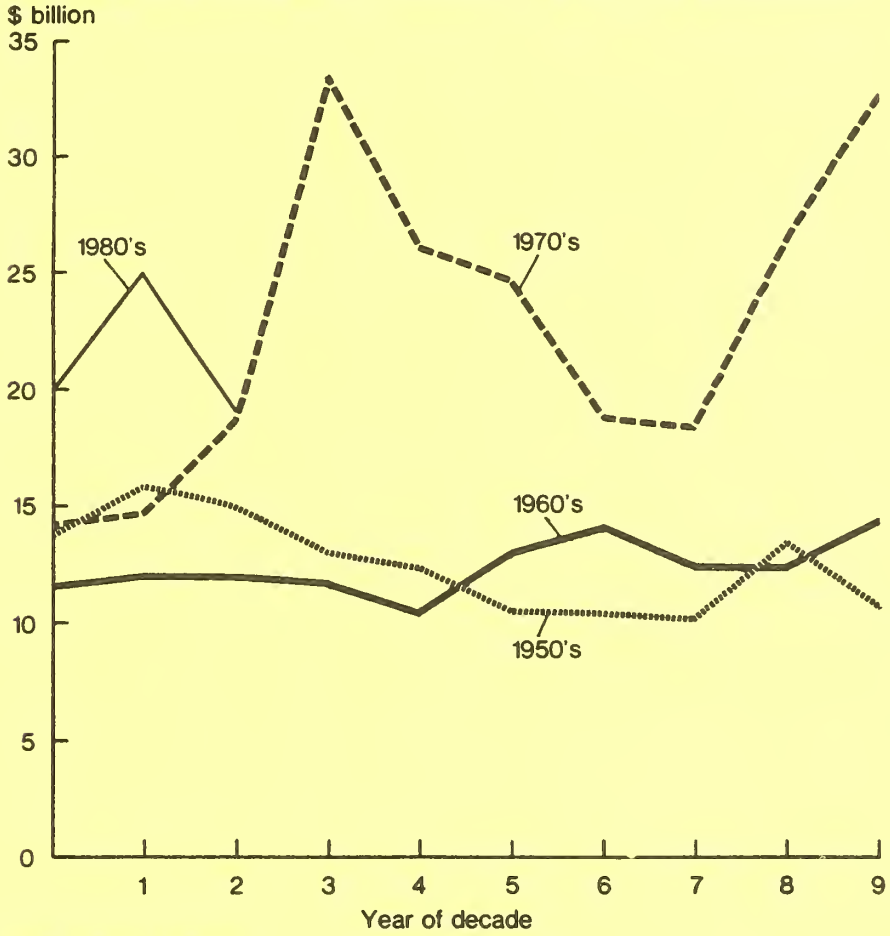
For Release: Wednesday, December 1, 1982

Marketing risks must be considered within the context of total farm risks. Farm risks are usually divided into three categories: production, marketing, and financial. Total farm risks, measured in terms of variability of returns, increased substantially during the 1970's. Net farm income, one measure of increased variability of prices and costs, has fluctuated widely since the early 70's, after remaining relatively stable over the 50's and 60's (Figure 1). The main source of the increase in risk compared to the 1960's was increased market and financial risks, not changes in production risks.

The current farm economic environment suggests why understanding the interrelationships between production, marketing, and financial risks is so critical. During much of the 1970's, farmers depended on increasing land values to expand their borrowing capacity. As long as inflation continued and land values increased, farmers could count on increased borrowing against the value of assets as a liquidity reserve in the event that production or marketing risks generated a negative cash flow. In essence, the potential for increased borrowing became their main risk management tool. As land values increased, their reserve borrowing capacity grew, and farmers were willing to select riskier investments and financial plans. Many farmers followed aggressive expansion plans and reaped large financial rewards. However, the recent drop in the inflation rate, higher interest rates, and lower farm prices have resulted in a decline in farmland values. The reserve borrowing capacity has been greatly reduced or eliminated and cannot be depended upon to compensate for production and marketing risks.

The impact of the change in inflation, interest rates, and farmland values on the financial position of a typical Mississippi Delta cotton-soybean farm has recently been demonstrated by Harrington, Schertz, Baum, and Jeremias (Table 1). They simulated income and operating expenses, current cash flow, and capital gains to demonstrate that rates of return on debt financing increased the rate of return to equity in 1979, was neutral in 1980, and decreased return to equity in 1981. Negative cash flows in 1980 were more than offset by capital gains, the usual situation through most of the 1970's. However, negative cash flows in 1981 were not offset by capital gains, and negative returns to equity resulted. This is the position many farmers find themselves in today. Their cash flow has been negative for the last two years and their borrowing capacity has been reduced by declining land values. They are in an extremely risky position entering 1983.

Instability of Net Farm Income Over Three Decades*



*After inventory adjustment.

Table 1--Rates of return, cash flows, and risk exposure of a Mississippi cotton-soybean farm with two levels of debt1/

Item	1979 Yields and prices		1980 Yields and prices		1981 Yields and prices	
	Full equity	50% equity	Full equity	50% equity	Full equity	50% equity
Cash Income	$310,000	$310,000	$250,000	$250,000	$260,000	$260,000
Cash operating expenses	165,000	165,000	170,000	170,000	215,000	215,000
Interest and principal payments	0	75,000	0	103,000	0	102,000
Net cash flow	$145,000	$70,000	$80,000	-$23,000	$45,000	-$57,000
Depreciation allowance (not paid in cash)	18,000	18,000	20,000	20,000	23,000	23,000
Allocation for operator and family labor, management and risk	29,000	2/26,000	30,000	2/27,000	35,000	2/31,000
Return to owner's equity from current income	$98,000	$26,000	$30,000	-$70,000	-$13,000	-$111,000
Capital gains (not received in cash)	170,000	170,000	155,000	155,000	-40,000	-40,000
Total return to owner's equity	$269,000	$196,000	$188,000	$85,000	-$53,000	-$151,000
Owner's equity	1,575,000	788,000	1,730,000	855,000	1,690,000	845,000
Rate of return to equity (percent)	17.1	24.9	10.9	9.9	-3.1	-17.9

1/ Based on a farm model that incorporates production, economic, and accounting relations for a hypothetical, but representative farm. 2/ Adjusted for net investment (principal payments) paid in cash.

It is within this context of cash flow squeezes and greater price fluctuation within and between years that management of markets and financial risks has become critical to the success of farmers. In keeping with the topic of this session we will concentrate our remarks on managing price risks. Although several methods of managing price risk are available like cash contracting, government programs, spreading out cash sales, storage, etc., we are going to concentrate on hedging strategies. Our purpose is to: 1) review what research has established about various hedging strategies, 2) discuss some of the limitations of this research, and 3) discuss these strategies in the context of the market and financial settings expected for 1983.

Hedging Strategy Research

A typical study of hedging strategies simulates the production or storage of crops and/or livestock using historical prices, yields, and costs. Once a strategy is chosen, futures contracts are sold (bought) at the appropriate time to establish the selling (buying) price of the output (input). By following each strategy for a number of years, the average return per year and variance of return over the years can be computed. Variance of returns is used to measure risk. The mean and variance of each strategy are compared to each other and to the results from using only the cash market. Those strategies with higher average returns and smaller variances would be judged superior to a cash only strategy. Strategies with lower means and higher variances would be considered inferior. The desirability of strategies with lower (higher) means and lower (higher) variances compared to cash depend upon each individual farmer's attitude toward risk.

Hedging strategies can be broken down into three general categories depending upon the criterion used in determining when to hedge. The three groups are routine, selective, and multiple selective hedging. Routine hedging strategies assume the product is priced each year at the same time regardless of the price level. Examples would be pricing expected crop production at planting or pricing cattle when they are placed on feedlot. Strategies of this type usually reduce price variation but also decrease average price received. For example, McCoy and Price found that routine hedging of fed cattle during 1965-1974 reduced the variance of profits per head by 71 percent but reduced average profits per head from $9.55 to $0.18 compared to cash only strategy. Erickson found similar results for cattle feeding over the period 1968-75. During 1971-1978, Kenyon and Cooper found that routinely hedging corn at planting reduced price variance by 13 percent and average price by 10 percent compared to cash market sales at harvest. Eddleman and Moya-Rodriguez report that routinely hedging soybeans in Mississippi during 1973-77 reduced returns per acre by 14 percent and the variance of returns by 32 percent. Only very risk averse farmers would find these routine strategies appealing. Experience with presenting these results to farmers confirms that most farmers are not interested in routine strategies. This observation is consistent with the empirical findings on individual risk preferences of farmers. Young reports that among studies of Australian and American farmers, approximately 50 percent manifested risk

preferring attitudes over at least some ranges when measurement technique did not preclude this possibility. Hence, economists have searched for hedging strategies that increase average returns without substantially increasing risks. This search has lead to what is called selective hedging strategies.

Selective hedging strategies base the decision on when to hedge on the relationship between futures prices and cash prices, costs, predicted cash prices, historical margins, or some other economic criterion. With a selective strategy, the decision-maker hedges only when the criterion is satisfied regardless of the stage in the physical process. If the criterion is never met, a hedge is not placed. If the criterion is met and a hedge is placed, it is maintained until the end of the production process. Selective strategies produce a wide range of results since the number of different strategies is almost endless. The significance of these selective strategies is that some of them increase returns and reduce variances simultaneously, while many of them increase returns and variances simultaneously. After surveying the literature on hedging strategies for livestock, Leuthold and Tomek reach two conclusions about selective hedging strategies. First, selective strategies are usually superior to a no-hedge strategy, and second, the strategies which have been the most attractive are those based on economic "common sense", such as selling futures only when a profitable feeding margin can be established (futures prices exceed break-even prices).

Most selective hedging strategies begin their search for profitable selling prices at the beginning of the production process assuming costs are fixed. However, several recent studies by Kenyon and Shapiro; Johnston, Shafer, and Griffin; Leuthold and Mokler; Spahr and Sawaya, indicate that the simultaneous hedging of major inputs and output prior to feeding improves the overall performance compared to strategies that only hedge the output. If the desired profit margin is not reached prior to feeding, the feeding process is initiated and a selling hedge placed when the profit margin criterion is met. Under this strategy, a profitable margin is usually obtained sometime before or during the feeding process. In the Leuthold and Mokler study, the three way hedge of feeder cattle, corn, and live cattle prior to feeding generated higher mean returns and smaller variances than only selling live cattle after feeding began. In all three studies, a relatively small percentage of the hedges placed involved both inputs and outputs (25 percent or less) but these 3 way hedges frequently occurred when subsequent cash only strategies produced large losses.

Multiple selective hedging strategies, according to Ikerd, establish hedges when market risks are increasing (prices falling) and removing hedges when market risks are declining (prices increasing). Hence, hedges may be placed and removed several times during one production cycle. In routine and selective hedging strategies, a hedge once placed is not removed until the end of the production process. Like routine and selective hedging strategies, the crucial question is when and when not to hedge. In multiple selective

strategies, this question is answered by the use of technical tools like moving averages, point and figure charts, and formations on bar charts. Studies by Franzmann, Brown and Purcell; Johnson, Shafer and Griffin, Kenyon and Cooper indicate that strategies based on technical indicators consistently have higher average returns and lower variances than the cash only strategy. The technical strategies frequently have greater returns than selective strategies but may also have larger variances.

In summary, average returns generally increase as the strategy moves from routine, to selective, to multiple selective hedging. The variance of returns varies greatly by strategy. Routine strategies typically reduce price variances across years compared to not hedging. The selective strategies may give smaller or larger variances than routine strategies, but consistently produce variances less than a cash market only strategy. Multiple selective hedging frequently produces larger variances than selective hedging.

Limitations

In terms of managing marketing risk, these studies have a number of deficiencies which are critical to their application and which should be addressed in future research. Three of these areas are 1) the simultaneous considerations of yield and price risk, 2) the use of technical tools in hedging strategies, and 3) the simultaneous consideration of production, market, and financial risk. While much has been learned, these gaps in knowledge limit the certainty with which strategies can be proposed, or used by farmers.

Production yield risks and price risks have not been simultaneously considered in most studies. Crop yields or growth rates of livestock are usually assumed constant. This assumption masks a large portion of the risks faced by producers. Those studies which do incorporate yield risk (McKinnon, Heifner) either hedge routinely or have as their objective the minimization of risks. These strategies generally do not appeal to farmers. Current research does not indicate what percentage of expected production should be hedged under various selective hedging strategies. This is a serious weakness because one of the most frequently asked questions by farmers is "How much should I hedge?" A recent study by McCanless on selective hedging strategies for Virginia corn producers indicates that no simple rules of thumb across various selective hedging strategies can be uniformly applied to answer this question. Much research is needed in this area to give practical guidelines for answering this important question.

The long term feasibility of using technical tools to place and lift hedges raises many questions among agricultural economists. The normal assumption is that futures markets can be characterized as a random walk or at least a "fair game" in which technical strategies would not in the long-run produce gains greater than those obtained from a riskless investment like T-bills. However, what scattered and mostly dated research that is available on the nature of futures market price behavior indicates that some futures contracts cannot be accurately characterized as random walks (Bear and Stevenson; Mann and Heifner; Cargill and Rausser; Purcell,

Flood and Plaxico). Hence, it may be possible to design technical strategies that consistently earn profits--at least over short periods.

A substantial effort by university extension personnel and farm organizations is being made to teach farmers basic technical tools. The recent widespread availability of relatively inexpensive and sophisticated minicomputers makes it practical for farmers to use a wide variety of technical tools. Many economists believe these tools are not going to be useful in the long run. Many traders think they have proven useful and are likely to continue to be useful. In any case, careful, rigorous, detailed research needs to be conducted to test the long-run usefulness of technical tools.

With respect to this problem, we would like to suggest two areas of research. First, an extensive study of the behavior of futures prices since 1972. This study should address two interrelated questions: 1) are futures price changes random walks, and 2) can technical systems be devised that consistently make profits when applied to prices outside the data base used to generate the system. The second study would be an ex post analysis of technical strategies published in the last five years. Most of the studies cited did not apply their technical tools on prices outside the data base or only analyzed a short time period outside the development data base. Sufficient time has now passed to give these strategies a more rigorous test.

The third general deficiency in knowledge of hedging strategies is that studies generally have not simultaneously considered production, marketing, and financial risks. A number of studies combine two of these areas, but none combine yield risk, selective hedging strategies, and alternative financial arrangements. The most comprehensive study to date explicitly analyzing all three areas of risk is that of Lutgen and Helmers. They simulated the interaction among financial arrangements, and alternative production and marketing strategies for an eastern Nebraska grain farm over the years 1961 through 1975. They conclude that there is a definite marketing-production interaction and that the performance with respect to firm growth, and the risk associated with a hedging strategy cannot be evaluated apart from production alternatives. Lutgen and Helmers only analyzed routine hedging strategies. They also assumed that prices and yields were uncorrelated. Their basic model needs to be expanded to include selective strategies and their impact on cash flows and growth of the firm under alternative equity situations. Purcell and Riffe found that selective hedging strategies based on technical trading systems dampened the amplitude of fluctuations in cash flow of a simulated cattle feeding operation during 1973-77. Barry and Willman found that bankers in Texas increased loan limits when producers forward contracted 1/3 to 2/3's of production. Their results indicate that when credit conditions are favorable, optimal growth plans will include contracting even by farmers with little or no aversion to risk, although the profit possibilites based on expected cash market prices may appear more favorable. More recently, Harris and Baker found that bankers in east central Illinois would not increase borrowing capacity by more than margin requirements

when producers hedge. This finding is contrary to the generally accepted idea that bankers will lend more to producers who reduce price variability through hedging.

Although these studies demonstrate that production, marketing, and financial risks are interrelated, they too have some deficiencies. The possibility of many different financial arrangements, including equity and cash flow considerations along with various selective hedging strategies, have not been evaluated to determine the nature of these relationships. The development of an adequate research base in this area is hindering the development of extension programs with farmers and lenders that effectively demonstrate how to simultaneously manage risks in all three areas to meet farm goals.

Strategies for 1983

Many crop farmers and some livestock farmers who have recently expanded, or have greater than average levels of debt have suffered two consecutive years of negative cash flows and have seen their borrowing capacity reduced by declining asset values. These producers may find the probability of financial failure in 1983 to be unacceptably large. These producers have several options. First, they could hope that 1983 would result in both high yields and high prices, and hence relieve their financial difficulty, but this is banking on an unlikely event. The review of hedging strategies indicated that this approach is generally the most risky. Or, they could manage their price risk by evaluating alternative marketing strategies and the risk associated with them. Currently, futures prices for 1983 crops are at levels that most producers in financial difficulty will find inadequate to meet their 1983 cash flow needs. Current crop futures prices will not satisfy the criteria set up in most selective hedging strategies. Hence, at this point in time, producers following selective hedging strategies would not hedge. Although most selective hedging strategies have historically been less risky, in 1983 they may not reduce risks to to an acceptable level. In addition, farmers could participate in commodity programs. The current government program of loan rates, target prices, reserve prices, and storage payments along with acreage reduction and paid land diversion offers crop producers the highest price with virtually no price risk. Finally, if producers cannot generate positive cash flows under government established prices, then perhaps they should consider selling enough assets and retiring enough debt to increase their probability of financial survival in 1983 to an acceptable level.

The current financial situation faced by many farmers is highly unfortunate. Many of these farmers find themselves in this position because they did not fully understand the relationship between production, marketing, and financial risks. Most of the hedging strategies discussed in this paper, if employed, would have generated higher crop prices in 1981 and 1982 and could have significantly reduced the current financial difficulties for those employing them. In the longer run, if more of the production, marketing, and

financial risks are to be borne by the private sector, then government, business, and university economists must continue to conduct research to more fully understand the relationships between production, marketing, and financial risks; and this research must result in programs for farmers and lenders to make them better able to understand and manage total farm risks.

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OPPORTUNITIES IN PRODUCER MARKETING

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1983 Agricultural Outlook Conference, Session #27
Washington, D.C.

For Release: (Wednesday, 12-1-82)

"FARMERS HAVE MASTERED THE PRODUCTION PROCESS -- THEIR NEXT ROUND OF GAINS WILL BE IN MARKETING." This statement appeared on the cover page of Farm Futures Magazine, October 1978. My Purdue colleagues in Agronomy took exception to this statement, as they believe there are still many opportunities to increase production skills. Besides the professional differences in viewpoints, the gains to be achieved may be relative in nature. When I was a senior at Iowa State University, one of the most productive counties in Iowa had a County Corn Production Club. Their goal was to achieve a county average of 100 bushels of corn per acre. The state average yield for Iowa was @53 bushels at that time. Now Iowa average corn yields run over 125 bushels in years of favorable weather conditions, and the top producers can achieve yields of 180-200 bushels per acre.

A similar example might be the average speeds obtained by the race cars at the Indianapolis 500 racetrack. Once they have obtained 200 m.p.h., it is much tougher to obtain the next 5 m.p.h. than it was when the top speed was 130-150 m.p.h..

Yields still vary considerably by locality and are important but much of variance is whether controllable marketing variation can be managed.

It's always good to begin by defining terms. To me, marketing means the determination of price, the delivery of the product to market, and the transfer of title.

What are the magnitude of the gains to be achieved? Of course, that depends upon where the producer is currently in the development of his marketing skills. At a recent Producer Grain Marketing Conference, Darrel Good, University of Illinois economist gave the following example: "During the last 5 years, the difference between the average monthly low price and the average monthly high price was over $100 per acre, using state average corn yields. On a typical 500 acre corn farm, that amounts to $50,000 extra profit per year, or $500,000 in 10 years."

Several people have used the example that, 2/3 of the producer's marketing is done in the bottom 1/3 of the annual price range. I concur, but that sounds terrible. The implication is that a simple strategy of selling 1/12 of production each month would generate an average price and beat 2/3 of the farmers. Before becoming too critical, one must realize that 1) Prices are much more volatile than they were in the decade of the 50's and 60's and 2) The export markets have grown to the point where we are dealing with International supply-demand conditions, especially for grains and oilseeds, and 3) With many of our Agricultural enterprises, there is a year's time lag in the production cycle -- i.e., only one crop produced annually, cattle are on feed for up to

12 months, a year's time passes from the time gilts are bred until the pigs are born, raised, and marketed. Expansion in the cow-calf enterprise takes an even longer time period.

There are several characteristics that are common to marketing agricultural products:

1) There are actively traded futures markets for our major crops and livestock enterprises. This means the producer can separate the pricing and delivery time and/or decision. It also means that they can extend the time of the marketing decision to approximately 2 years for grain and up to a year for livestock.

2) Prices of agricultural products are difficult to predict with a high degree of accuracy. There are a number of factors that continuously change. Sometimes prices change because of factors that were accurately forecast and widely advertised. Yet the producer must make a speculative decision in accepting a price.

3) Delivery is determined for livestock by the weight and grade. With livestock, the producer has only a limited weight range when he can profitably market hogs or cattle. The time period is usually about 30-45 days. Premiums and/or discounts are offered for hogs and/or cattle of a certain weight and grade, depending upon the market needs. There are premiums and discounts offered for grain, depending whether the grain trade needs grain or is receiving more than they need at a given time. The producer can marginally modify the optimum marketing decision by cash flow needs, income tax considerations, and storage.

4) There are 2 parts to any stated price:

a. The price level as reflected by the futures markets. This is determined by world supply and demand conditions (in grains) and

b. Basis, the difference between the local price and a specified futures contract (option). The basis reflects local conditions, carrying charges and delivery charges. The decisions on price level and basis can be made separately.

With livestock, producers can:

a. Forward Contract for future delivery for a specified quantity for delivery at a specified time, at a definite price.

b. Hedge by selling (or buying) a futures contract -- taking an opposite position in the futures market from the cash situation.

With the grain, the choices are more numerous. The producer can:

a. Forward Price before harvest by:

1. Hedging -- in which case he fixes the price level and continues to speculate on the basis he will receive at delivery.

2. Contract with an elevator -- where a specific price and quantity is set.

3. Basis contract

There are advantages and disadvantages to both hedging and contracting. In most cases, what is listed as an advantage for one strategy is a disadvantage for the other. For example, the advantages of using the futures market is:

Flexibility -- in choosing the delivery time, and setting the basis.

Flexibility -- in changing one's mind, in case market conditions change.

The disadvantage in using the futures is that the producer (and his lender) must: 1) Understand how the futures markets operate and relate to the farm business, 2) Put up margin money, and perhaps additional maintenance margin money.

b. At harvest time, the producer can:

1. Deliver and price at the harvest
2. Deliver and price at harvest -- buy offsetting futures contracts
3. Store on farm and/or in commercial storage for later sale
4. Deliver and Price Later (DP) -- title is transferred upon delivery
5. Deliver at harvest with the basis fixed, with the price based on the futures at a later date, minus the set basis.
6. Basis contract
7. Deliver at harvest and delay or defer payment until after Jan. 1 - to defer income for tax purposes.

There may be a partial payment of 75-80 percent of the current price when selling on a basis contract. In this option, the producer can avoid paying storage costs, but he gives up the opportunity for basis appreciation.

With DP sales, there is a fixed service charge (in the range of 15-20 cents per bushel for corn) for the first 2-3 months, then a variable service charge or 2-3 cents per bushel per month. Title passes at time of delivery and the producer is a creditor to the buyer. There is usually no payment until the price is fixed.

After harvest, when grain is stored, it can:

1. Be left unpriced

2. Forward Priced

   a. Using the futures market
   b. Forward contract

3. Basis Contract

4. Be fed to livestock

5. Placed under CCC loan and the Farmer Held Reserve, if the producer has met eligibility requirements

Sources of Financial Risk

1. Price level change -- the producer makes a speculative decision on pricing. There are 2 types of risk; he can:

   a. Accept a poor price
   b. Pass up a good price

2. Basis Risk -- this can be improved through hedging

3. Cash Flow Risk -- especially when hedging -- margin account must be maintained.

4. Storage -- The producer is responsible for maintaining quality. Discounts for spoiled grain may mean the income is less than expected.

5. Default on the part of the buyer -- Bankruptcy.

6. Increased production costs when feeding livestock to heavy weight.

7. Severe discount for selling overly fat livestock.

The proper way to manage risk is different for each producer. It depends upon the producer's:

   a. Equity position -- what are the implications of loosing?
   b. Marketing skill of the producer. This covers the complete spectrum. The producer with more marketing skill can take more risk.

What can producers do to improve marketing? This topic also depends upon the specific situation and the skills and ability of the individual. General guidelines include:

   1. Know your production costs - enterprise record accounts.

   2. Spread sales -- use scale up and/or scale down selling.

   3. Become familiar with factors that affect supply-demand conditions.

   4. Understand technical analysis -- it can be a valuable tool for selective hedging strategies.

   5. Hire a marketing consultant.

Producer Marketing Education

The winter of 1982-83 is the "Teachable Moment" for anyone in Marketing work. Nearly all producers want to learn more about Marketing. The demand for Extension Educational Programs is running very high. As educators, how should we go about filling this need? What should we teach?

1. One of the first things to remember is a basic principle of Adult Education. Educators tend to be "subject matter" oriented. We want to hold a meeting on Hedging, or Marketing Alternatives. Adults are "problem oriented". By this, I mean they are interested in improvoing their marketing skills because they have, or may have, an income problem. In view of this, we communicate only when we relate hedging and/or marketing skills, (or any other topic) to

their problem. This means our examples should be up to date, real world problems, and use data applicable to their area.

2. If you want to communicate, engage the people in conversation. If this is not possible, get them involved in working through an example.

3. A series of meetings is better than single meetings, particularly if they are scheduled about a week apart, during the time that farmers are not busy in the fields.

4. Charging a reasonable fee improves the educational environment in 2 ways:

a. You get the producer's attention. If they pay for something, they are going to get their money's worth.

b. It put the pressure on the instructor to perform -- but it also provides some funds to supplement the resources available.

5. Provide notebooks, and texts. Make it resemble a classroom situation.

What Should We Teach?

This must be adapted to the area and the commodity. In Grain Marketing in Indiana, I start out with the basics. In essence, I try to pick out the highlights of my semester course in Grain Marketing and condense it into 6 sessions - 3 hours each.

The broad topics covered include:

1. Fundamental Price Analysis
2. Technical Price Analysis
3. Economics of Drying, Shrinkage, Storage, and Grade Factors
4. Marketing Alternatives
5. Developing a Marketing Plan

At each meeting, the current market situation is discussed. Government crop reports, weekly export inspections, soybean crush statistics, and crush margins are likely topics.

In the livestock area, you could target meeting around a producer group, such as cattle feeders, and hold quarterly meetings following the release of major reports. The same could be done for hog producers. Topics such as selling on grade and yield, hedging livestock, how to compare bids, etc., could be taught.

"There is no Royal Road to mathematics". That's one of the best lessons I learned from my high school principal who taught Math. The same lesson is true of marketing -- "There is no royal road to marketing". If the producer wants to improve his skills, he must work at it.

The stakes are high. He must get involved. He must become a professional. This takes time and effort. It's not unreasonable for an average producer to spend 20-30 minutes per day keeping up with the current marketing statistics and conditions and perhaps 1-2 hours per week on studying marketing information. If he is a large specialized farmer, someone in the organization could likely spend the majority of his efforts in handling the marketing tasks. If they don't have the skill or the inclination to do this, then the tasks should be turned over to a professional firm, or the producer should decide to settle for a lower return. Making marketing decisions involves risk. And where there are risks, there are also opportunities.

PUBLIC SERVICES IN RURAL AREAS

OUTLOOK '83

Thomas F. Stinson, Economic Research Service

1983 Agricultural Outlook Conference, Session #28
Washington, D. C.

For Release: Wednesday, December 7, 1982

Local government activity has increased substantially during the past two decades. Few would be surprised to hear that spending by localities grew from approximately $45 billion in 1960 to almost $220 billion in 1980, nearly a four-fold increase. Nor would the near doubling of real (constant dollar) local spending between 1962 and 1980 come as a great shock. Media coverage of the larger cities' fiscal problems has given even those with only a casual interest substantial information about local government finance.

Most of what is popularly known, however, concerns the finances of central cities. Today, I want to partially redress that information imbalance by focusing attention on a different set of governments, those where spending is substantially below national norms. This group, which I will call counties below a poverty line for government services, has received relatively little recent public notice. Now, following two decades of institutional changes thought to improve the poor's access to local services, it seems appropriate to analyze whether service levels have actually improved. Such an analysis seems particularly timely in light of current attempts to redefine the role of the federal government vis a vis the States and localities.

The paper which follows has three major sections. It begins with a relatively short discussion of overall trends in local government spending from 1962 to 1977. That section is designed to provide a background against which changes in the number of counties below a poverty line for government services can be measured. The major portion of the paper is then devoted to examining progress made toward guaranteeing access to a minimum adequate standard of local government goods and services. The final section notes socio-economic characteristics of counties below a poverty line for government services in 1962, 1972 and 1977.

Before I begin, two brief technical notes. Data restrictions force most of the discussion to focus on the years 1962, 1972, and 1977. The Census of Governments, the only consistent data source providing information on all local governments, is conducted only at five year intervals. Similarly, inter-state differences in the level of government responsible for providing some services force most comparisons to be done on the basis of local government expenditures by all local governments within a county area.

TRENDS IN LOCAL GOVERNMENT FINANCES: 1962-1977

Three primary trends in local government finance were apparent during the sixties and seventies. The first, the large increase in local spending (even when adjusted for inflation), is generally well-known. The second, the increased percentage of local revenues coming from higher levels of governments, less so. The third trend, a widening dispersion of expenditure levels, has received little notice. Each of these items is discussed in more detail below.

First, however, I want to draw your attention to the major institutional changes affecting local government during the sixties and seventies. This may cover old ground, familiar to most of you, but in putting together the list I was struck by both the number and the importance of the changes which occurred. Changes included passage of Medicare-Medicaid, the Economic Opportunity Act, and the rest of the Great Society Programs; passage of General Revenue Sharing; the shift from categorical aid to block grants; the tax-expenditure limit proposals, of which California's Proposition 13 received the most publicity; and the peaking of federal aid in the late seventies. Events equally important to local governments, but with less direct effect on local finances include enactment of civil rights legislation, particularly with respect to voting rights; Baker v. Carr, the one man one vote rule which ended rural domination of State legislatures; the continuing flow of school desegregation decision; the Serrano decision in which a State court held that the educational quality available to students should not depend upon the wealth of the school district; and the National Environmental Policy Act which established a federal role in the control of water and air pollution. Individually, each change had important implications for local government finances. Together they virtually remade the policy arena in which local governments operate.

Increased Expenditures

Local government expenditures averaged $802 per capita in 1977. SMSA county spent somewhat more, $860; rural counties averaged only $648 per capita. Expenditures in 1962 were $234 and $180 per capita in SMSA and nonSMSA counties, respectively. Local government spending increased by more than 250 percent during that 15 year interval.

That rate of increase is deceptive, however, since prices of almost all goods and services have increased dramatically from their 1962 levels. Expressing expenditures in terms of dollars of constant purchasing power provides a more accurate reflection of the true extent of the growth in local government spending.

Even in constant dollar terms, however, the increases are impressive. For all counties, real local government expenditures rose from $222 per capita in 1962 to $316 in 1972 and $326 in 1977, an increase of nearly 47 percent over 15 years. From 1962 to 1972 such spending increased at an annual rate of more than 3-1/2 percent in constant dollars. Similar rates of increase were found in both SMSA and nonSMSA counties. Real spending grew from $234 to $345 and then to $349 per capita in the urban counties, and from $180 to $240 and to $263 in rural counties.

Spending on local education, the largest area of expenditures, during that period showed an even more dramatic shift, increasing forty-four percent between 1962 and 1972, then declining in real terms between 1972 and 1977.

A slightly different view of changes in local spending can be obtained by examining changes in the ratio of local government spending to personal income. The period 1962-1977 was one of significant real economic growth, and one would expect that a portion of that increase would go for additional

local government services. The ratio of local government spending to personal income appears to have remained relatively constant during that period. A slight downward trend may have occurred, but variation about that trend has been significant. Actual percentages ranged from slightly more than 10 percent in 1962, 1972, 1975, and 1976 to approximately 9.4 percent in 1978.

Increased Reliance on State and Federal Aid

The second major shift in government finances between 1962-1977 was the increased local dependence on State and Federal aid. Changes in the sources of local government revenue are shown in table 1. Intergovernmental aids were only 30 percent of local revenues in 1962. They increased to 38 percent by 1972, and to 43 percent by 1977. The increase between 1962 and 1972 was primarily, but not entirely, due to additional State aid. After 1972 federal aid, including general revenue sharing was the source of the growth.

Although the pattern was similar for both urban and rural counties, rural counties have been more dependent on others for revenues. Local governments in metropolitan areas received only 27 percent of their funds from State and Federal aids in 1962, while rural counties received 38 percent. By 1977, that gap had closed considerably with SMSA counties receiving 42 percent, and nonSMSA counties, 47 percent of their funds from higher levels of government.

Property taxes, the predominant revenue source in 1962 steadily diminished in importance, during that period, declining from 48 percent of revenues in 1962 to 33 percent in 1977. This change, it should be noted, was prior to Proposition 13.

Widening Range of Expenditures

The dispersion of local government expenditures around the mean grew considerably between 1962 and 1977. Per capita operating expenditures in 1962 were concentrated within a relatively narrow band; their standard deviation was only $46. By 1977 the distribution had spread considerably and its standard deviation had more than tripled to $156. The same pattern was observed for per pupil education spending. The disparity in local government spending levels has increased considerably during the past two decades.

Such a trend is not necessarily deterimental, however. Individuals' tastes for public and private goods are not identical and there is no reason to suspect that a system which forces everyone to consume identical levels of public services will be more satisfactory than one allowing more diversity of choice. What is important to determine is whether differences in spending are due primarily to demands for service levels above national norms, or whether the disparity is due to increasing numbers of communities unable to afford minimum adequate service levels.

PROGRESS AGAINST A POVERTY OF GOVERNMENT SERVICES: 1962-1977

Before improved access to local services can be noted, a minimum adequate service level, or poverty line, must be established to serve as a standard for comparisons. For local government services that task is complicated by the fact that actual measures of local government output are not available nationally. As a result, one must use local government spending as a proxy for local service quality.

A poverty line for government services could be defined in a number of ways. One could, for example, choose an arbitrary dollar value below the mean expenditure, or that level of spending below which 25 percent, or some other percentage of the population fell. It would also be possible, using synthetic budgets, to construct a minimum adequate expenditure level based on standards set by appropriate professional organizations. For various reasons, none of those methods were used.

Instead, a slightly different approach, relying on the theory of revealed preferences was adopted. In simplest terms what was argued was that citizens can assess the quality of local government services they receive, and that through the political process, they can adjust the amount and quality of services provided to levels consistent with their preferences.

Under these assumptions spending levels equivalent to a minimum adequate service level can be identified by selecting a group of counties in which one would expect to find public service offerings consistent with citizen preferences, (not held to sub-standard levels due to short term adjustment problems or constraints on income). The lower bound of this group's expenditure distribution could then be used as a standard against which spending in all counties in the nation could be compared. Such a method has the advantage of providing a fixed standard against which progress over time can be measured, while at the same time providing a mechanism which allows the incorporation of changes in tastes or responsibility for services in that minimum standard.

Expenditure standards for this study were developed using counties in the 4th through 7th deciles of 1970 median family income as a reference group. Local government spending in those counties was assumed to be sufficient to meet local preferences. A sample was drawn from that group, and two lower limits for expenditures identified. The first, corresponding to the level of spending exceeded by 95 percent of the counties in the reference group, was called the lower bound poverty line. An upper bound poverty line, the spending level exceeded by 85 percent of the counties in the reference group, was also noted. Lower and upper bound poverty lines were identified for per capita local government operating expenditures (less spending on highways, welfare, and hospitals to allow for interstate differences in functional responsibilities) and for per pupil operating expenditures for local education.

Results, 1962

Slightly more than 3 percent of the nation's counties--107 counties in 14 states--were below the lower bound poverty line for government services in 1962. Nearly twice as many counties--194 in 14 States--spent at levels less than the lower bound line for education. More than 2.8 million people lived in counties below the local government services line, while approximately 1.3 million children attended schools in counties where per pupil spending for education was far below national norms.

Substantially larger numbers of counties were below the upper bound poverty lines. One thousand seventy-four counties in 32 States--more than 28 million people--were below the upper local expenditure line, while 750 counties in 30 States--5.9 million pupils--were below the upper bound for spending on local education.

Counties below lower bound spending levels were concentrated in the South. More than 50 percent of those spending less than the standard for local education were in Alabama, Arkansas, or Mississippi. Nearly two-thirds of those counties below the lower local government expenditure standard were in the 4 States of Arkansas, Mississippi, Tennessee, and Virginia. In 10 States, 80 percent or more of the counties spent at levels less than the upper bound for local government services. Only 5 States--Alabama, Georgia, Mississippi, South Carolina, and Tennessee--had 80 percent or more of their counties below the upper bound for education.

Use of average per capita (or per pupil) expenditures within a county area as a measure of local government service adequacy is not entirely satisfactory, however. Problems with using any expenditure measure as a proxy for quality are well-known and will not be dealt with here. In addition, use of county area averages may also hide significant intra-county differentials in services. Counties below a government services poverty line may have localities in which services are more than adequate, while counties above may have areas where services are substandard.

These problems in determining the actual number of people receiving less than a minimum adequate level of services leave one hesitant to emphasize the absolute size of estimates of that population. But, such estimates, with all their problems, are useful standards for measuring the nation's progress in improving access to local government services. The next two sections examine that progress between 1962 and 1977 under two alternative sets of assumptions.

Progress, 1972 and 1977: Absolute Standard

One way to update 1962 government services poverty lines so they may be used in 1972 and 1977 is to adjust only for price increases. This assumes that the minimum service level in 1962 remained relevant through 1977. An absolute standard, it allows for no changes in tastes over time, nor does it allow for the possibility that technological improvements have made it possible to provide the same level of service at a lower cost. It simply measures the present costs of producing the same market basket of goods and services, using the same inputs and technology, as before.

When actual expenditures in county areas in 1972 and 1977 were compared to the absolute standards created by multiplying the 1962 standards by 1972 and 1977 implicit price deflators for State and local government, there was a dramatic decrease in number of counties below the government services poverty line (table 2). Eight counties (138,000 people) were below the lower bound for local government spending in 1977, and 9 counties (18,511 pupils) spent at levels less than the lower bound for education. Results using the upper bound measure were similarly impressive. Only 59 counties, 895,000 people, were below the standard for local services in 1977 compared to the 1074 counties, 28.3 million people, below in 1962. Thirteen counties (47,000 pupils) were below the upper bound for education in 1977.

Closer examination of those counties below either education standard or the lower bound for local government services revealed that in almost every instance the low spending levels could be attributed to unusual institutional structure--military bases or Indian reservations dominating the county--or to problems of allocating local expenditures in cities and school districts which cross county lines.

If one accepts the absolute standards, it appears that by 1977 virtually everyone in the United States lived in a county in which per capita local government expenditures, and per pupil expenditures for education, adjusted for inflation, exceeded the level thought minimally adequate in 1962. Either consciously--through increased State and federal aid--or accidentally, there has been a major improvement in access to a minimum adequate level of government services.

Results, 1972 and 1977: Dynamic Standard

Absolute standards, however, may produce meaningless, even misleading comparisons when used over a long time period. Such measures identify the extent to which access to a particular set of goods and services has changed. They say nothing about whether that particular market basket is still the appropriate one to consider. Changes in tastes, technology, and real income all could affect the public's definition of a minimum adequate service level and yet go unrecognized. Since, as noted earlier, the years studied span a period of substantial changes in local responsibilities, it is unlikely that the level of service considered adequate in 1962 would be considered sufficient in 1977.

Dynamic standards incorporating changes in tastes as well as prices were developed by using the same method as was used to obtain the original standards, substituting 1972 and 1977 expenditure data for that in 1962. Once again upper and lower bounds for both local government services and education were estimated.

Improvement, while not as dramatic as with the absolute measures, was once again considerable (table 3). Counties spending less than the lower bound for local services decreased by 50 percent. By 1977 only 48 counties with approximately 800,000 residents were below. For education the number of counties spending less than the lower bound decreased by almost 25 percent to 159 counties (about 1 million students). The percentage decrease in number of counties below the upper bound for local expenditures was also substantial. The number below fell from 1074 to 570--28 million to 11.8 million people. But, the number of counties spending less than the upper bound for education remained virtually constant over the 15 year study period.

Counties below the dynamic poverty lines for local services remained concentrated in Southern and Appalachian States. The incidence of government services poverty in those States was much less pervasive, however. Only two States--Arkansas and Kentucky--had as many as seventy percent of their counties below in 1962. Substantial reductions in counties below occurred everywhere but Oklahoma and South Dakota where 6 and 4 additional counties, respectively, fell below. Some States--North Carolina, South Carolina, Virginia and West Virginia had decreases of sixty percent or more (from very large bases) in the number of counties below the upper standard in 1977.

Results using the education standard were quite different. Seven States had more than 75 percent of their counties below the 1977 upper bound poverty line. More than 50 percent of the counties in Mississippi were below the lower bound in 1977. Mississippi had more than 25 percent of the counties spending less than the dynamic lower bound for education. Five States--Alabama, Georgia, Mississippi, South Carolina, and Tennessee--accounted for more than 80 percent of the counties below the lower bound.

In most States the number of counties spending less than the upper dynamic standard for education remained relatively constant. Exceptions were Georgia, North Carolina, and West Virginia where there were decreases of 20 or more in the number of counties below between 1962 and 1977, and Oklahoma, which had an increase of 27 in the number of counties below in the same period.

CHARACTERISTICS OF COUNTIES BELOW A POVERTY LINE FOR GOVERNMENT SERVICES

Poor counties were heavily represented among those counties spending below national norms for local government services. So were counties with a high proportion of Blacks. Demographic variables other than those related to income or race had little relationship to the incidence of government services poverty. Differences in population, population density, percent urban, and degree of rurality as measured by Hines, Brown, Zimmer code--all had almost no effect on the likelihood that a county's local governments would spend at levels below the poverty line.

In 1962, forty-five percent of those counties below the lower bound for local services, and 49 percent of those spending less than the lower bound for education were in the tenth decile (the poorest 10 percent) of counties when ranked on percent of families with incomes below the 1969 poverty line (table 4). Seventy-three percent of counties below the lower local services line, and 84 percent of those below the education standard were in the bottom 3 deciles.

When 1962 upper bound levels were used, 43 percent of those below the local services standard and 49 percent of those below the education line were from the poorest 20 percent of counties. Approximately two-thirds of the counties in the poorest decile spent at levels less than either the local expenditure or the local education standard.

By 1977 characteristics of those below the lower bound for public services had changed noticeably. Only 15 percent of the counties below were from the poorest decile, compared to 45 percent in 1962. Between 1962 and 1977 spending in 43 of the poorest counties had increased to levels above the lower bound, although spending in two other poor counties fell below that level by 1977. This improvement is particularly notable when compared to that in the 9th decile where only 2 fewer were below in 1962 than in 1977. By 1977 twice as many counties in the 9th decile as in the 10th were below the lower local services line.

Improvement by poor counties was not as dramatic on the other measures. The number of the poorest counties below the upper bound for local services fell from 226 to 121, more than a 45 percent decline, but the ratio of those below in the tenth decile to the total number below remained constant. The incidence of local government services poverty among counties in the poorest two deciles fell considerably, however, from more than 75 percent to less than 40 percent.

Progress by poor counties in spending for education between 1962 and 1977 was minimal. This was especially disquieting since substantial improvement apparently occurred between 1962 and 1972. For example, the number of

counties below the lower bound for education, who were also from the poorest ten percent of counties fell from 96 in 1962 to 28 in 1972. In 1977 that number increased to 80. A similar pattern--201, 139, 189, for 1962, 1972 and 1977 respectively--was observed for those below the upper bound for education.

Closer examination revealed a number of counties shifted from below to above, or above to below the education spending line between 1962 and 1977. Of the 96 counties below in 1962, 44 spent at levels greater than the lower bound by 1977. Twenty-eight additional counties from the poorest decile, however, fell below after 1962.

The pattern for the other apparently relevant demographic variable, percent Black in 1970, was similar to that for percent in poverty (table 5). Forty counties, 37 percent of those below the 1962 lower bound for local services, were from the blackest ten percent of U.S. counties. By 1977, only 5 counties, 10 percent of those below, came from that group. Progress in percentage terms was not as dramatic when the upper bound was used as a standard, but the actual drop in number of counties below, from 248 to 107, was still impressive. Despite that, however, approximately one in three of the blackest 10 percent of U.S. counties was below the upper bound for local services in 1977.

Results for Black counties were similar to those for low income counties when changes in the number below the education standard were examined. In 1962 ninety-five of the counties below the lower standard (about 49 percent) were from the blackest 10 percent of counties. In 1972, fourteen counties (about 8 percent), and 1977, ninety-seven counties (about 60 percent) were from that group. Those below the upper bound followed a similar pattern 220 in 1962, 109 in 1972, and 211 in 1977. Sixty-two of those below the lower bound in 1962 and 1977 were above the lower limit for education spending in 1972. Twenty-two of that group were above the upper limit as well.

CONCLUSION

Although this research leaves a number of important questions unanswered several potentially significant findings emerge. Among the more interesting and policy relevant are the following:

• If one accepts 1962 levels of local government spending in middle income counties as a proxy for a minimum adequate level of government services, it appears that by 1977 virtually everyone in the United States lived in a county where services were adequate. This is a major improvement in access to a minimum adequate level of government services. Changes in institutional structure appear to have equalized access throughout the nation to levels of local services and education thought adequate in 1962.

• If one allows for changes in tastes between 1962 and 1977, however, progress has not been as dramatic--particularly in spending for local education. The greatest improvement occurred in expenditures for local services where the number below either the upper or the lower bound decreased by about 50 percent during the 15 year period. The number below the lower standard for education spending decreased by about 20 percent by 1977, those below the upper bound, by only 3 percent.

• Low income counties gained improved access to the level of local service thought minimally adequate in 1977. The number of counties below either the lower or the upper dynamic poverty line who were also from the poorest counties declined substantially. Still, though, approximately 25 percent of all counties below the upper bound came from that decile, and nearly 40 percent of the counties in that decile were below the upper local expenditure standard.

• Findings were discouraging for those hoping to see improved access to educational quality in poor counties. Substantial progress appeared to be made between 1962 and 1972, only to be almost totally lost by 1977.

Table 1. Local Government Revenue Sources as a Percentage of Total Revenue for County Areas

	Intergovernment Aid			Taxes		Charges and Other Revenue
	Total Aid	Federal Aid	State Aid	Property Taxes	Other Taxes	
	Percent					
All Counties						
1962	30	2	28	48	7	15
1972	38	5	33	40	8	15
1977	43	11	33	33	8	15
SMSA Counties						
1962	27	2	25	50	8	15
1972	36	5	32	40	9	14
1977	42	12	32	34	9	14
Non SMSA Counties						
1962	38	2	37	44	3	15
1972	42	3	39	37	4	17
1977	47	11	39	31	4	18
Counties with population between 10,000 and 50,000						
1962	40	1	39	42	3	15
1972	44	3	41	34	4	19
1977	48	10	41	38	4	19
Counties with population less than 10,000						
1962	38	1	37	46	4	13
1972	39	2	37	43	3	16
1977	42	10	35	38	3	17

Source: Thomas Stinson, "Fiscal Status of Local Governments," in Nonmetropolitan America in Transition, 1981. Amos H. Hawley and Sarah M. Mazie, eds., Univ. of North Carolina Press, 1981.

Table 2: Progress Against Local Government Services Poverty, Absolute Standard, 1962-1977

	Number of Counties	Population (Pupils)
Current Expenditures, Lower Bound		
1962	107	2,806,501
1972	10	156,379
1977	8	138,349
Current Expenditures, Upper Bound		
1962	1074	28,315,461
1972	193	3,601,478
1977	59	895,501
Education Expenditures, Lower Bound		
1962	194	1,342,142
1972	12	38,243
1977	9	18,511
Education Expenditures, Upper Bound		
1962	750	5,858,233
1972	60	306,395
1977	13	47,081

Table 3: Progress Against Local Government Services Poverty, Dynamic Standard, 1962-1977

	Number of Counties	Population (Pupils)
Current Expenditures, Lower Bound		
1962	107	2,806,501
1972	82	1,594,504
1977	48	789,451
Current Expenditures, Upper Bound		
1962	1047	28,315,461
1972	567	11,897,042
1977	570	11,826,347
Education Expenditures, Lower Bound		
1962	194	1,342,142
1972	168	969,520
1977	159	1,081,387
Education Expenditures, Upper Bound		
1962	750	5,858,233
1972	736	5,401,036
1977	730	5,176,803

Table 4: Counties below a poverty line for government services by decile, percentage of families below 1969 poverty level.

	Decile										
	1	2	3	4	5	6	7	8	9	10	n
All Local Services, Lower Bound											
1962	48	16	15	13	5	5	2	2	0	1	107
1972	18	16	17	12	9	3	5	0	1	1	82
1977	7	14	6	9	5	2	3	0	0	2	48
All Local Services, Upper Bound											
1962	226	235	162	133	111	82	49	36	23	17	1074
1972	124	128	99	84	59	31	23	8	9	2	567
1977	121	127	113	85	54	33	19	11	5	2	570
Local Education, Lower Bound											
1962	96	42	26	12	4	6	1	0	6	1	194
1972	28	30	36	23	20	8	16	3	3	1	168
1977	80	33	13	15	7	3	5	1	1	1	159
Local Education, Upper Bound											
1962	201	167	122	80	65	36	25	22	18	14	750
1972	130	130	106	111	94	53	45	26	26	15	736
1977	189	143	123	99	73	30	29	19	17	8	730

Table 5: Counties below a poverty line for government services by decile percent black, 1970.

	Decile										
	1	2	3	4	5	6	7	8	9	10	n
All Local Services, Lower Bound											
1962	40	11	11	8	9	6	7	4	7	4	107
1972	7	9	16	11	10	11	3	3	8	4	82
1977	5	3	6	4	5	5	5	3	7	5	48
All Local Services, Upper Bound											
1962	248	173	153	117	97	97	53	41	63	32	1074
1972	114	77	87	72	63	52	28	21	36	17	567
1977	107	73	82	78	63	50	30	27	45	15	570
Local Education, Lower Bound											
1962	95	29	18	6	10	10	7	7	8	4	194
1972	14	24	27	28	23	22	4	5	16	5	168
1977	97	28	5	7	4	5	4	3	2	4	159
Local Education, Upper Bound											
1962	220	129	95	66	62	54	38	27	35	24	750
1972	109	127	127	83	86	68	30	34	47	25	736
1977	211	123	93	84	68	45	21	26	31	28	730

RURAL PUBLIC SERVICES IN AN ERA OF GROWTH

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1983 Agricultural Outlook Conference, Session # 23
Washington, D.C.

For Release:

OUTLOOK '83

Public service delivery and financing are greatly affected by population growth, but public services can also be a factor in causing population growth. The living climate resulting from the way services are provided and financed can be a factor in attracting population growth, but population growth can be the source of fiscal stress and problems in adequate service delivery. This paper is an analysis of these interactions between population and public services. More space is devoted to discussing how population growth affects service delivery because of the many elements involved, but both sides of the coin are important issues for policymakers.

How Public Service Delivery Affects Population

The many causes of the rural turnaround in the 1970's have been a much considered topic. Some people have gone to rural places for employment opportunities, some for retirement, and others for an alternative lifestyle. Our purpose is not to judge the various reasons for the shift but to point out that public service delivery can be one factor in the success of an individual area's growth.

Service delivery and financing[1] affect populations in an area both directly, through attracting people, and indirectly, through attracting businesses. Consider first the influence of service delivery directly on population. Analysts are finding evidence that environmental and quality-of-life factors are growing in relative importance, along with economic variables, in determining the housing location patterns of people.[2] One important set of quality-of-life determinants is the public services provided in the local community. Quality of education, police protection, and fire protection are important inputs into the perceived living quality of a particular location. Similarly, basic components of the infrastructure such as water and wastewater control are key aspects of the living environment. Sprawl caused by residences locating along water or sewer lines illustrates the importance of the infrastructure.

A basic question is whether these services affect only the choice of locations within a given labor market or if they are a factor in the choice of people to live in one labor market versus another. The perceived overall living

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1. For the duration of this section, financing is implicitly considered one aspect of service delivery.

2. For example, see Ben-Chieh-Liu, Quality of Life Indicators in U.S. Metropolitan Areas, Washington, D.C.: U.S. Environmental Protection Agency, 1975.

environment is a factor in people's decisions as to what labor market area they want to live in; and to the extent that public services are a factor in the perception of lifestyle in the general area, they influence the location people choose. Education, and in some cases, water and sewer facilities, may be important parts of this perception.

Frequently, the services are more important location considerations once people have chosen a particular labor market area. Then they can choose between alternative residential choices based on length of commute, housing supply, and public service availability. In this circumstance, the vitality of the general area is not influenced by service delivery, but locations within the individual communities in the labor market area are.

Much the same can be said about the indirect effects that public services have on attracting population through business locations. Business location decisions are often dominated by certain prerequisites to operation that must be in place before an area is considered. Depending on the industry, these could include access to raw materials, a highly skilled labor force, or access to a transportation system. After consideration of the prerequisites to location, and therefore choice of a region within which to locate, tradeoffs between location determinants are made. One set of location considerations is public service delivery.

Smith, Deaton, and Kelch concluded that public services (viewed broadly) have their most important influence on location decisions in communities which do not have either too many or too few locational attributes.[3] That is, places which have substantial prerequisites may need little inducement for industry to locate, and places with few prerequisites may be able to do little to attract business. For the in-between places, Smith, Deaton, and Kelch found industrial site ownership by public groups, better fire protection, and availability of industrial revenue bond financing to be significant factors in increasing the probability of plant locations. Police protection, processed industrial water supply, industrial sewage processing, and solid waste disposal are other considerations that have been found to be important in plant location decisions.

In sum, public services can influence the location of business activity. In most cases, this influence will be on where the business locates within a given region rather than on the choice of a region.

An important side point must be made. Tax incentives are often used in an attempt to attract industry. The evidence suggests that taxes are of secondary importance in influencing the location of business and will rarely affect the location choices between regions of the U.S. The use of tax concessions can, however, have undesirable effects. From a national perspective, tax concessions to business are likely to be self-defeating because they do not influence the overall level of industry, only the geographic distribution within regions. Therefore, in aggregate, they are simply tax reductions for business. With

3. E. D. Smith, B. J. Deaton, and D. R. Kelch, "Location Determinants of Manufacturing Industry in Rural Areas," Southern Journal of Agricultural Economics, July 1978.

international firm locations becoming more important, the lost tax revenues must be envisioned as a net loss to U.S. citizens. The recent location of a Volkswagen plant in New Stanton, Pennsylvania may be an example of this.

Further, where tax concessions are granted, the location of business is likely to have a negative net effect on local government fiscal positions. To the degree this is true, the tax concession must be paid for by other taxpayers. Since the benefits of industrial location tend toward certain groups, this form of tax financing of business can have undesirable equity effects. For example, retired persons may receive no benefits from business and yet pay higher taxes to offset the industrial costs. This issue is discussed at greater length below.

Population Effects on Public Service Delivery

We will focus on the impacts that growing populations have on the fiscal climate of the growing communities. Declining communities may experience more severe difficulties, but the relative predominance of growth in rural areas and the lack of time preclude more than passing comments on the effects of decline.

With population growth comes increased revenues, but also increased expenditures. Thus, growth does not automatically spell improved fiscal conditions, but the net effects depend on which grows faster, revenues or expenditures. This discussion is separated into an expenditure and a revenue section. These are separable issues, as expenditures relate to the new demands for services and the cost of providing the services, whereas revenues refer to the mechanism for financing the services.

Expenditures

Several generalizations about expenditure-related population change impacts can be made. First, they are nonsymmetrical. Government expenditures do not grow both X percent for every Y percent increase in population and decline X percent for every Y percent decline in population. Difficulties in closing down part of a subway system illustrate why costs are not symmetrical. Similarly, road systems and other parts of the infrastructure cannot be easily expanded or contracted in a manner proportional to population change. Labor-intensive services, like education, can be shifted more easily when population changes, but even in these cases employment cuts can be difficult as population falls. Second, the change in expenditures (and fiscal effects) associated with a change in population depends on the speed of growth. Ten percent growth in population in a 100,000-person town imposes fewer costs than 100 percent growth in a 10,000-person town, though both places would grow by 10,000 people. These generalizations tell us that the impacts of population growth on expenditures must be examined separately for each community. Nonetheless, there are insights to be gained from studying the experiences of other places.

The response of service demands to population growth depends substantially on the characteristics of the new population. In-migrants are generally younger, and if migrating from the Northeast, may be used to a relatively large government sector. In selected places, however, growth may derive from development of retirement communities or return migration of people as they retire. Whatever the stimulus for a given community's growth, the in-migrants are unlikely

to have tastes and preferences which are identical to those of the existing population, so they can be expected to alter somewhat the existing voting pattern for officials, taxes, and service levels. Effects of shifts in the voter composition cannot realistically be forecast and rural communities can best adapt by being flexible to new ideas and preferences. Below, we refer to expenditures necessary to provide existing services rather than the expenditures to meet what may be new service demands.

Capital spending to expand the infrastructure and increased operating expenditures may both be necessary with population growth. First, consider capital expenditures. Need for capital spending depends on the excess capacity of the existing infrastructure. Those with excess capacity may be able to absorb rising populations without needing new capital, while others may need substantial infrastructure development to accommodate similar population changes. In many circumstances, for example, school systems may be able to accept a large number of new students by including one or two new students in each existing classroom. If the school system is operating at maximum pupil/teacher ratios, on the other hand, new school rooms must be added. Similarly, expanded roads, water and sewer systems, hospitals, and recreation facilities may be necessary in some communities but not in others, depending on the existing infrastructure. Thus, data on per-capita capital expenditures in other communities is unlikely to be useful for estimating impacts in any particular growing community.

The need for infrastructure development depends on characteristics of the community. Those that anticipated the growth may have prepared a capacity sufficient to handle new people. Those that have previously declined but began to grow again may have their infrastructure substantially in place. Others can be expected to need development and to suffer varying degrees of inconvenience. Similarly, those that have grown because of major industrial locations are likely to need infrastructure developments. In any event, those with the most rapid growth rates are most likely to have insufficient infrastructure.

Another demographic trend, that which indicates fewer people per household, may be as important in affecting infrastructure development as population changes. People per household in the U.S. declined from 3.14 in 1970 to 2.75 in 1980. Sewer and water lines, roads, and some other facilities are more dependent on the number of households and density of housing units than on the population size. The current trend will cause greater demand for facilities unless the density increases to offset the effects of more housing units.

New infrastructure to accommodate population growth or expanded housing units must frequently be put in place before the new population arrives, creating fiscal stress for those already in the community. The tax base already in place bears the burden of the infrastructure development and the construction process, for they may need to begin well ahead of tax base expansion. In boom towns, the problem of the in-place population bearing the capital costs may occur at both ends of the boom. As the boom begins, prudent planning may require beginning infrastructure development before the population locates. As the boom winds down and people leave, the remaining population may be left to pay the debts for infrastructure construction and maintenance on a facility with excess capacity.

Now consider operating expenditures. Discussion of operating costs immediately brings to mind size or scale economies, with the hope being that more people will mean lower service costs per capita. The preponderance of

studies fails to support any significant size economies for government services. Police, fire, and education services are labor-intensive and provided from small stations near people, so few savings result as population expands. Small communities may reap some benefits if they have one policeman whose services can be spread over 1,000 people rather than 500, but they may see all the benefits evaporate immediately as a second policeman is added for the first person over 1000. For larger places that make relatively continuous purchases of inputs, few size economies can be expected. Some other services, like water and sewer, may have operating cost economies, but these are likely to be offset by capital spending costs that rise rapidly with the number of housing units and population density. The evidence generally indicates that per-capita operating expenditures rise with population, because greater depth and breadth of services are provided. Rural communities which generally fail to offer the full scope of government services may find that expansions in the quality and types of services delivered will offset any small economies of size that can be achieved. In Table 1, it is shown that per capita local government expenditures drop as population goes from 10,000 to 50,000, but rise consistently as population increases above 50,000. Per-capita expenditures for the largest cities average 58 percent more than for the smallest. In sum, small communities may find some cost reductions as population expands, but economies of size should not be expected to provide large savings for growing communities.

Revenues and Fiscal Position

Economic activity is the basis of public revenue, and any increase in activity will increase revenue flows. As growth occurs, revenue flows are likely to balance with expenditure needs over time. This is true, at least, if the new residents and industries earn incomes that are, on average, equal to those earned by current residents. Significant reductions in millage rates are unlikely because new businesses and people will not only increase revenues but will also increase the demands for services.

There are circumstances in which revenues may be insufficient to cover the expenditures associated with service demands of the new population. One is the expenditure demand caused by the need to expand the infrastructure before the new population is in place. As noted above, in this case expenditures grow before the increased population is present.

Even once the population increase is in place, the revenue and expenditure flows may grow in different patterns. Own-source revenues generally respond to increases in economic activity only after some lag, with the length of lag depending on state laws and other factors. For example, a new building or house is often not included in the tax rolls until it is completely constructed, and then the taxes may not be due for a year or more. For some properties, the construction process may be brief, but for others quite long. Ten years or more may be necessary to build a nuclear generating plant, two or three years to build a factory, and several months to build a house. Similarly, lags can enter into payment of many other taxes and charges. Yet, services must be provided to the workers and their families during the construction phase, and this group may be larger than the final population increase. After the construction phase, the revenue lag may persist for several years. So while revenues may balance with expenditure over time, there may be significant short-term problems. In very rapidly growing places, these timing problems can become particularly acute.

TABLE 1

COUNTY AREA EXPENDITURES BY SELECTED FUNCTIONS
FOR POPULATION SIZE GROUPS, 1976-77

Expenditures	Population Size Group						
	Less than 10,000	10,000-49,999	50,000 to 99,999	100,000 to 249,999	250,000 to 999,999	1,000,000 or More	Total
Education	359.99	319.55	330.52	349.67	361.23	392.45	355.29
Police	21.80	20.93	25.31	31.24	47.08	69.07	41.65
Fire	4.95	8.16	13.57	18.32	26.07	30.35	20.71
Sewerage	8.16	16.73	23.18	34.76	40.96	36.40	31.97
Recreation	4.80	6.63	10.27	14.43	23.36	28.82	18.26
Direct General	675.86	600.85	642.00	724.30	839.79	1,066.75	802.20

SOURCE: U.S. Department of Commerce, Bureau of the Census, 1977 Census of Governments, Volume 4, Number 5 Compendium of Government Finance, August 1979, Table 52, p. 211.

Generally speaking, the tax revenues of residents are supplemented by business revenues to provide the desired level of local services. Residential tax revenues which increase when new people arrive must be supplemented by new business revenues to cover the expenditure demands of new citizens. The need for business revenues is even greater if new residents move into unoccupied housing rather than stimulate housing construction because little residential tax increase will occur. Fiscal problems are liable to be be created if new businesses locate outside the municipal boundaries, while new population lives in the city. Revenues may also fall short of expenditure needs if tax concessions are granted or if substantial infrastructure commitments are made to attract industry. In these circumstances, the economic vitality of the area may be improved, but the local government's fiscal condition may be worsened. Much of the economic benefit may spread broadly around the area in which the industry locates, while the government expenditures are paid by the residents of one community. Local governments are rapidly becoming aware that promised spin-off benefits of new industry are slow in coming and each firm must be expected to pay its own way.

Federal aid has often been seen as a way to offset the fiscal crunch created by the different time paths of revenue and expenditure flows. After allowing for inflation, federal and state aid to local governments tripled between 1960 and 1979. Federal direct payments to local governments increased 30-fold over this time period. The population-change/federal-assistance-revenues-received relationship, however, is by no means obvious and will certainly not exhibit a high positive correlation. That is, rural governments will not necessarily receive large automatic increases in revenues simply because their population has grown. The conflicting effects of population characteristics within the formulas for aid programs means that federal aid does not always grow with population increases. Bryce tells the story of Portland, Oregon, which discovered a population undercount that was causing the city to lose revenue sharing funds.[4] Yet, increasing its population statistic would cause the city to lose more Community Development Block Grant funds (which are channeled to lowest growth areas) than would be gained from revenue sharing. The existence of hold-harmless clauses, maximums and minimums, and other population-related factors in aid formulas (population density, rural population, and so forth) also prevent federal assistance from automatically meeting the increased needs of growing places. Thus, even in a period of bright prospects for federal aid, as in the recent past, federal programs could not be counted on to automatically assist rapidly growing places. In the current environment, state and local governments will need to be creative in finding ways to solve fiscal problems of population shifts.

I will mention, though, that the 1980 decennial census of population and housing will have an effect on receipt of federal assistance because of its frequent use in assistance programs, but measuring the precise impact requires information which may not be available for several years. In Table 2, it is shown that 14 different types of data from the census appear in 123 places in federal programs. These statistics are found in 69 programs, with $78.4 billion obligated in fiscal year 1979, including the Lower Income Housing Assis-

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4. Herrington, J. Bryce, "The Impact of the Undercount on State and Local Government Transfers," in U.S. Department of Commerce, Bureau of the Census, Conference on Census Undercount: Proceedings of the 1980 Conference, U.S. Government Printing Office, 1980.

TABLE 2

DECENNIAL CENSUS OF POPULATION AND HOUSING FACTORS AND FREQUENCY OF USE

	Number of Assistance Programs Using Factor
Total Population	20
Population by Age	11
Population by Race	1
Population Migration	6
Population Density	4
Urban Population	1
Rural Population	13
Urbanized Population	3
SMSA Population	1
Farm Population	4
Income	32
Land Area	14
Housing Conditions	12
Educational Attainment	1

SOURCE: Emery, et al., p. 81.

tance Program of the Department of Housing and Urban Development and the Comprehensive Employment and Training Act.[5]

Conclusions and Policy Recommendations

Growing areas are unlikely to realize reduced fiscal stress from their increased economic activity. Revenues from existing tax sources do rise, and some state and federal aid programs yield increased revenues, but demands for services for new businesses and residents will likely create expenditures that absorb all of the revenues. With the need to build infrastructure early in the growth process and the lags in receiving revenues, growing areas can experience substantial fiscal stress. Growing areas experience these problems mostly because of timing of revenue flows versus expenditure needs, and the problems may be minor in moderately growing places. Growth in the demand for services and the types of services demanded will also increase expenditure needs in many growing places. The solution is to provide loans to offset the short-term stress on the most impacted areas, those with the most rapid growth rates. It might be noted that declining areas experience their difficulties because of past infrastructure decisions and because remaining populations are often lower-income and older, requiring greater services. Declining places, therefore, may be in need of grants as a redistribution mechanism.

Existing federal programs, even those instituted before the New Federalism, cannot be relied upon to automatically provide revenues to offset the effects of population growth. Existing programs could be modified to target more funds to the rapidly changing areas, but this would dilute the ability of a program to accomplish its original intent. Rather than expect aggregate federal assistance to offset the effects of rapid change, a better approach would be to have programs specifically developed to deal with the most severely affected places and permit other federal programs to accomplish other objectives. Similarly, state aid programs, though they would need to be evaluated separately for each state, are unlikely to be pre-programmed to offset the imbalance between revenue and expenditure flows in rapidly growing places.

Carefully designed federal aid programs that meet the needs of the most rapidly growing places seem a practical solution to the revenue timing problems. The emphasis of the New Federalism program makes it very difficult to envision such aid. In fact, even in a different administration, this would be unlikely. The downturn in federal aid to state and local governments actually began during the Carter Administration when aid, after taking out the effect of inflation, peaked in 1978 and has declined since. The current administration can be expected to deal more with broad-based macro policies than the needs of individual distressed places; therefore, these needs are unlikely to be met here.

State governments can step in and provide loan or grant programs as needed. Again, this seems unlikely on the heels of the fiscal limitations fever of the late 1970's, given the currently sluggish economy and large reductions in federal aid to state governments. Even states with brighter fiscal climates may be unwilling, at least in the short run, to tax their slower-growing areas to provide fiscal relief for the more rapidly growing places, so prospects are slim for new direct aid from the states.

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5. Emery et al., p. 80.

States can help local areas in several ways other than providing funds directly. Laws which shorten lags in the receipt of revenues represent one way. For example, state laws can be altered to permit property taxation on the basis of percentage of construction completed. State aid formulas which use population statistics can be adjusted to reflect changes more rapidly. For example, state school aid can be based on the current year's attendance rather than that of the preceding year. Formulas based on census population statistics can use population estimates to keep the formulas more realistic in distributing grant funds.

Self-help may be much more important in the coming decade. State and local governments will find it particularly important to avoid reducing the fiscal base through providing tax concessions in an effort to attract new economic activity.

New approaches to financing infrastructure may be appropriate. Assessments and connect charges that place the burden of new infrastructure on the new population, or at least new homes, rather than on the existing population, may become necessary. Charges of this type are already becoming frequent in California and have the advantage of insuring that the people moving into an area pay the costs of their location even if they choose to move out later. This can avoid a boom-type phenomenon where people move in and move back out, leaving the remaining population to pay for needed new infrastructure.

User charges for services of all types must be considered as a mechanism for funding more services in an era of growth. They insure that the people using the services pay for them. Also, they allow easier determination of the level of services demanded, a particularly important consideration when populations are changing. User charges grew rapidly as a nonmetro revenue source in the 1970's and this trend is likely to continue.

AGRICULTURAL EQUIPMENT OUTLOOK
Emmett Barker
President
Farm and Industrial Equipment Institute
1983 Agricultural Outlook Conference, Session #29
Washington, D.C.

For Release: 1 December 1982

As with most suppliers of inputs, the agricultural equipment manufacturing industry is eagerly awaiting a return to more prosperous days for our nation's farmers.

Just how and when this will occur is the subject of a great deal of speculation. It can be said, however, that manufacturers believe a slow but firming trend in levels of equipment purchasing will take place over the next several months with a much stronger response in late 1983 and 1984.

Further declines in the cost of borrowed money, continued low levels of inflation and the fact that many farmers have pushed their equipment to the limit would suggest that any positive movement in commodity prices could cause equipment sales to increase. When farmers do start returning to their local dealerships in significant numbers, they will be much more selective in their purchases and will, no doubt, do considerable shopping around to take maximum advantage of price discounts and interest payment waivers. In a growing number of instances, they will lease rather than purchase major items.

Favorable to a possible upward movement in agricultural equipment sales is the fact that fully informed bankers will soon begin advising their farmer clients to make purchases in order to take advantage of price discounting which will disappear as dealer and manufacturer inventories are brought under control. Banker encouragement to buy could be especially prevelant where farmers have little or no debt, significant land equity and also have certificates of deposit maturing now.

Contributing to potential increased equipment purchases includes the recognition that a number of farmers currently are enjoying more financial success than they want their neighbors to know about. This is especially true where 1982 production was booked at prices far more favorable than current cash positions and where bumper yields are prevailing. A further factor which would support a firming trend in equipment demand is that more

acres of production are coming under the responsibility of highly skilled managers. These on-farm executives look at trading equipment in a total business decision-making process. This will lead to a more constant upgrading of the agricultural equipment used in the various enterprises ... even in marginally profitable circumstances.

While American agriculture today is dependent upon mechanization, there is a consensus developing which suggest that we may never again see the high numbers of total units sold as was experienced in 1973-74 and in 1979. As a matter of fact, much discussion is heard about using the "1982 lows" as a reference point for future sales comparison rather than historic highs of previous years. It is appropriate to note that 1982 unit sales could represent the lowest possible level of agricultural equipment purchases without beginning to seriously erode the productivity of America's farms and ranches.

What are the intermediate (three to eight years) consequences to agriculture as a result of the depressed level of sales and the loss of corporate profitability to equipment manufacturers?

In past years, as soon as new technology could be satisfactorily adapted to agricultural equipment it was made available because of the highly competitive business climate. The economic dislocations suffered by the industry may slow down the rate of new product introductions, because the capital resources to retool are not available, and the level of research and testing has decreased due to personnel and research funding cutbacks at the companies.

A second intermediate consequence could be a change in the way equipment is financed between time of manufacture and sale to the farmer customer. Traditional floor plans could become much shorter necessitating dealers to do more of the financing, or there will be far less equipment in stock from which a farmer may choose. The most probable result will be that equipment, especially major items, will not be manufactured until ordered by customers.

A third intermediate consequence will be a continuing consolidation of dealerships. Those remaining will be larger, financially stronger, with better facilities and personnel to service their area's farmers.

A fourth intermediate consequence, albeit of unknown impact, will be the fact that the industry is seeing the largest single exodus of trained, experienced agricultural equipment people that has ever occured. Much of what might be called the "institutional memory" is being lost because of early retirement encouraged by companies as a cost saving measure and by the simple fact that the greatest number of these people were hired 25-35 years ago when the industry began its period of great growth.

While the real world demands we face head-on certain negative circumstances that currently prevail in the agricultural equipment manufacturing industry, the real world also demands that sight not be lost as to the great opportunities ahead. Even under these difficult times, equipment manufacturers still provide farmers the most modern, efficient and productive equipment found anywhere in the world. Even under trying circumstances, new technology is being researched, tested and incorporated at remarkable rates. Comparing advertising copy in farm magazines from a decade ago with products advertised today will reflect some measure of this fact.

New products for the new agriculture hold a great promise for the future. While it is not yet clear as to who will surive this period of economic transition as agricultural equipment manufacturers, more than likely there will continue to be excess manufacturing capacity for several years. This will keep the equipment manufacturing industry very competitive for the foreseeable future ... both home and abroad ... benefiting farmers and consumers alike!

11/12/82
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FARM AND INDUSTRIAL EQUIPMENT INSTITUTE
410 NORTH MICHIGAN AVENUE • CHICAGO, ILLINOIS 60611 • 312/321-1470

EMMETT BARKER • PRESIDENT

To: Trade Press and Flash Report Subscribers

From: Ed Berzanski, Director of Statistics
(Contact: Rita Zimmer, Statistical Assistant)

Subject: October 1982 FED Flash Report

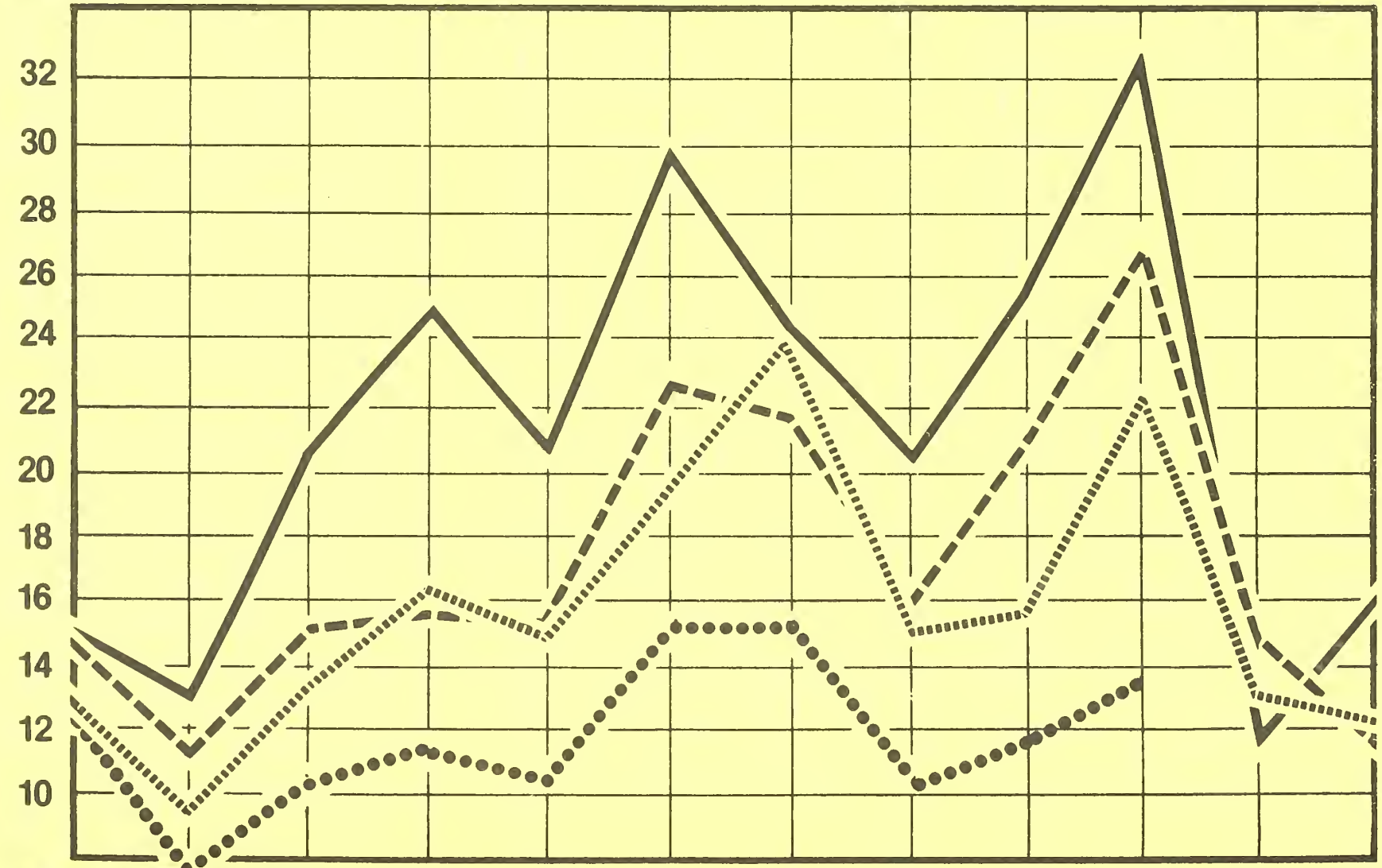
The Farm and Industrial Equipment Institute of Chicago, IL, today announced preliminary retail sales in units of the following equipment for the month of OCTOBER 1982. These data are as follows:

UNIT RETAIL SALES

EQUIPMENT	OCTOBER 1982	OCTOBER 1981	%	JANUARY-OCTOBER 1982	JANUARY-OCTOBER 1981	%
Farm Wheel Tractors:						
2-Wheel Drive 40 And Under 100 HP	4,005	4,793	-16.4%	36,007	44,023	-18.2%
2-Wheel Drive Over 100 HP	2,614	5,706	-54.2%	24,964	36,559	-31.7%
Total 2-Wheel Drive	6,619	10,499	-37.0%	60,971	80,582	-24.3%
4-Wheel Drive	623	880	-29.2%	5,695	8,018	-29.0%
TOTAL FARM WHEEL TRACTORS	7,242	11,379	-36.4%	66,666	88,600	-24.8%
Combines (Self-Propelled)	3,013	5,592	-46.1%	12,222	21,445	-43.0%
Balers (Bales under 200 lbs)	527	1,097	-52.0%	8,402	13,047	-35.6%
Forage Harvesters (Shear Bar Type)	868	1,266	-31.4%	4,586	6,523	-29.7%
Mower Conditioners	835	1,293	-35.4%	13,143	17,570	-25.2%

These data are, in part, estimates which are subject to revision when final detailed data become available. Because of the seasonal nature of the industry, comparisons of monthly data from one period to another should be done with extreme caution. These data represent most, but not all, of the manufacturers in each product category being sold at retail in the fifty states and The District of Columbia.

TRACTORS,[1] COMBINES, BALERS, FORAGE HARVESTERS, MOWER CONDITIONERS, MANURE SPREADERS, WINDROWERS

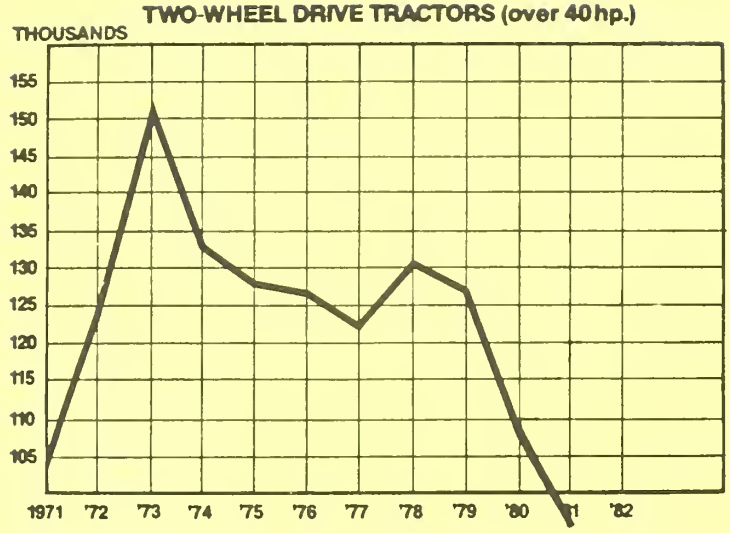


(1) TRACTORS OVER 40 H.P.

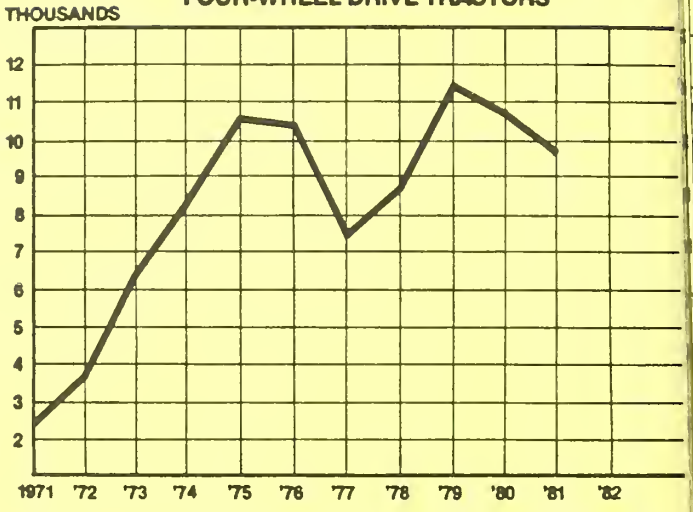
W-97

7686

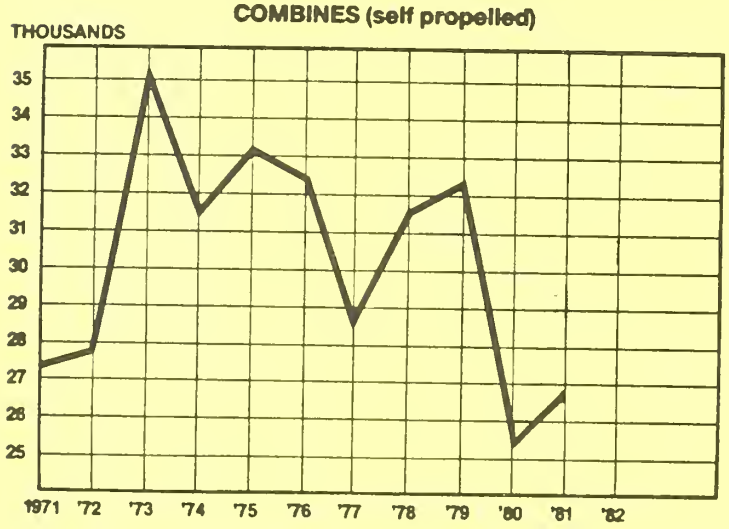
TWO-WHEEL DRIVE TRACTORS (over 40 hp.)



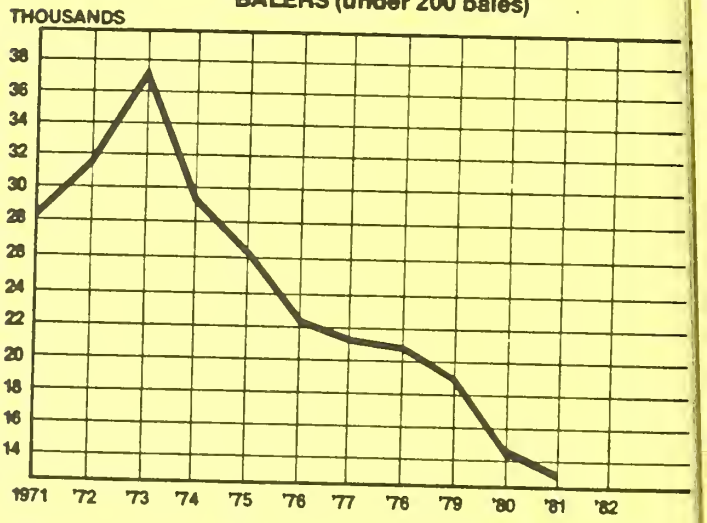
FOUR-WHEEL DRIVE TRACTORS



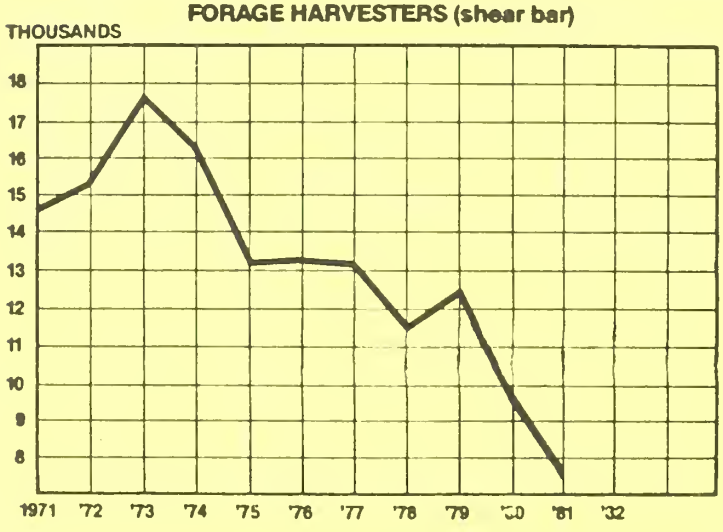
COMBINES (self propelled)



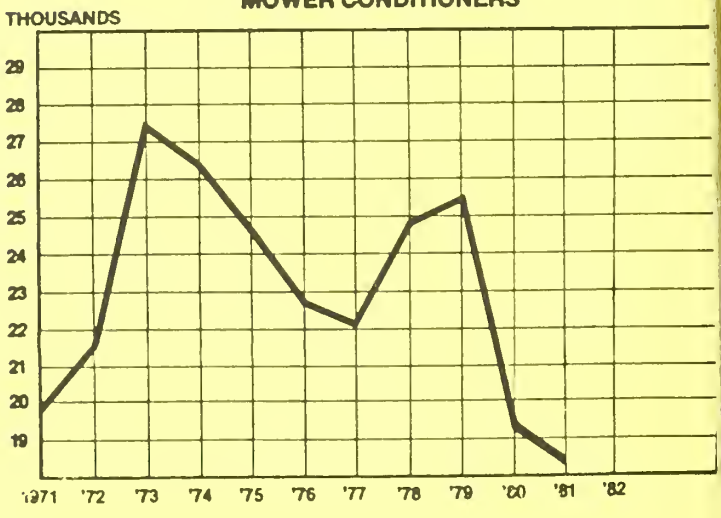
BALERS (under 200 bales)

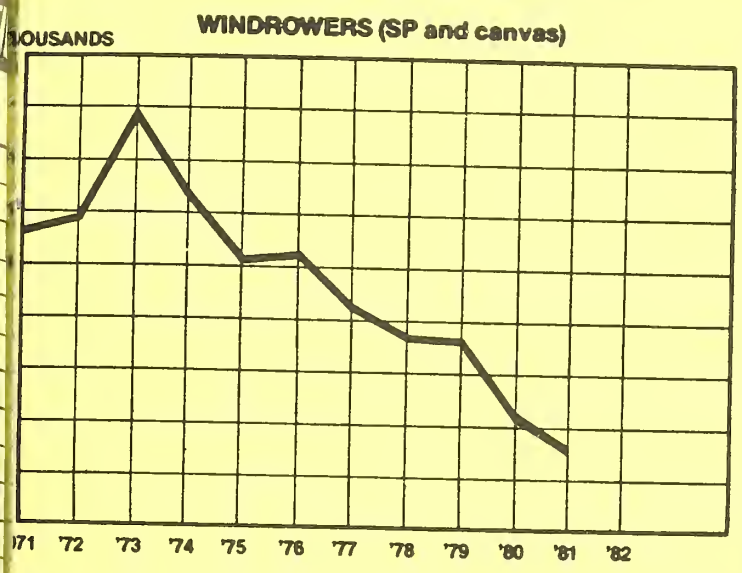


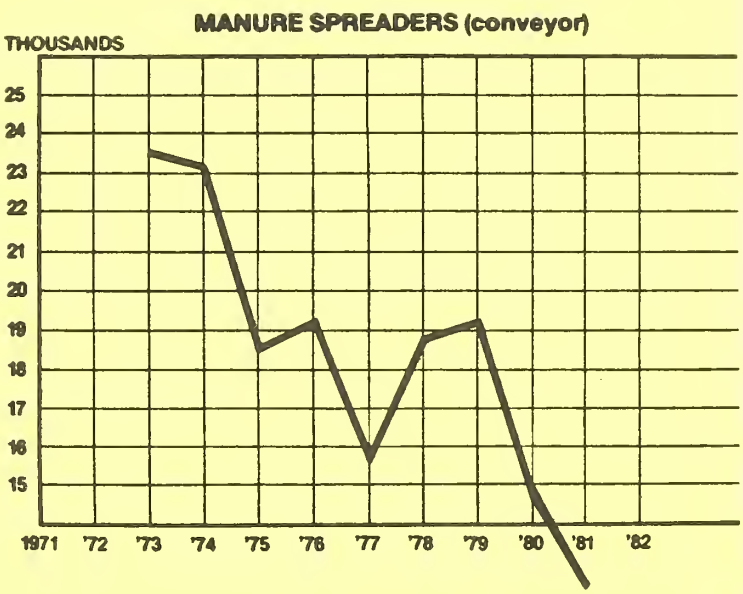
FORAGE HARVESTERS (shear bar)



MOWER CONDITIONERS







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Dr. Timothy M. Hammonds, Food Marketing Institute

1983 Agricultural Outlook Conference, Session #30
Washington, D.C.

For Release: Wednesday, December 1, 1982

FOOD SHOPPER BEHAVIOR CHANGES

TIMOTHY M. HAMMONDS

I am very pleased to be appearing before you in 1982 now that we have a major shift in investor attitudes toward this industry. Stock markets have just discovered supermarkets.

This discovery reverses a longstanding climate of investor indifference toward this sector, and well it should. When economic recovery comes it will be led by consumer retail spending and supermarkets will be on the front line of that revolution. But an even more fundamental reason exists for changing investor attitudes. The supermarket industry has been busily repositioning itself over the last ten years for the America of the 1980s and beyond.

Much of this repositioning is due to recognizing and responding to the changing consumer, the title subject of this talk. But credit must also be given to a systematic development program for improving total system productivity, our second topic for today.

Before we begin, let me pause to acquaint you with our association. FMI is the largest and most successful grocery distributor trade association. We are located here in Washington representing supermarkets and grocery wholesalers in research, education, and public affairs. All of the large distributor corporations which spring readily to mind are members, but fully one-half our membership is composed of one-store operators, and over three-quarters of our members are independents (those with ten stores or less). We, therefore, bring together the total industry under one roof, from the smallest operator to the largest.

Turning now to food shopping, perhaps the most important message to deliver today is that America is changing and the food distribution industry must change with her. More than most industries, food distribution is a mirror of the American consumer. This happens in part because we see almost every family in the country at least once a week. But the real reason is that food is such an important part of our total lifestyle, a reflection of our national personality.

When lifestyles change, the food America serves and eats changes. This is the basic reason why the supermarket is now undergoing changes of its own on a scale unmatched since the earliest days of its short 50 year history.

Dr. Hammonds is Senior Vice President for the Food Marketing Institute, 1750 K Street, N.W., Washington, D.C. 20006

This industry is evolving with the consumer. Although the history of American industry is to wait until it is too late to make fundamental corrections, the supermarket industry is evolving side by side with the shopper.

Let's take just one small example. The supermarket industry was one of the first in the country to realize the most literal interpretation of the American "melting pot" was a myth. As a result, supermarkets helped lead us in the celebration of cultural diversity which now lends so much strength and richness to our country.

The evolution we have been talking about is an ongoing process. As long as consumers are changing, the industry will continue to change with them.

At FMI, we conduct a continuing series of consumer research studies to understand the forces at work in our society. Two years ago our focus was on nutrition and health. This year it is on the battleground between lifestyles and economic uncertainty. It is this most recent research work that I would like to share with you today.

In February of this year FMI, in cooperation with Woman's Day magazine, surveyed a national, projectable sample of supermarket shoppers through the firm of Yankelovich, Skelly and White. The extent of recent changes in behavior, quite frankly, surprised us.

Three out of four said they had changed their lifestyles within the last year or so. Two out of three said they had changed the food they serve and eat over this same period. That is certainly a groundswell worthy of note.

Perhaps of equal note, we found almost no insulated socio-economic group. In fact, the vast majority of those making significant changes come from the middle and upper socio-economic groups.

Why the changes? Are they for nutrition and health? No, they are not. Saving money is the prime motivator today. This does not mean that health and nutrition concerns have been completely submerged. These concerns are indeed still motivating behavior changes and will continue to do so in the future. It simply means that this current has been overwhelmed by the tidal wave of economic uncertainty for the time being. As an illustration of this point, the single biggest worry in our sample this year was the fear of job loss by the interviewee or someone in his or her family.

Now, exactly what behavior changes did we find in the last year or so? We found:

- less eating away from home at restaurants and fast food outlets
- more eating together as a family
- less of an attitude that serving any food at any meal is acceptable (more traditional meal patterns)
- greater use of unit pricing
- greater use of coupons

- less rushing from store to store to find a bargain (more store loyalty, more one-stop shopping)

- increased purchasing of generics and store brands

- less brand loyalty, especially among those of 50 years of age and younger.

This list raises many interesting points for discussion. However, because time at this session is short, let me confine my comments to the most interesting question: brand loyalty.

Our findings do not mean that brand loyalty is dead. Quality products which deliver real value for the dollar still command consumer loyalty. At the same time, it is clear this loyalty is not what it used to be. This has occurred for a variety of reasons, at least two of them resulting from actions taken by the manufacturers themselves: the rapid expansion of coupons issued, and the heavy use of deal merchandising.

Let's take these one at a time. Coupons have become very popular with consumers. This fact coupled with the very tight competitive market brought on by our recession has caused a virtual explosion in the number of coupons issued. While this has been a good short-run strategy for many individual manufacturers, the long-run effect may be quite different. As shoppers begin to come to the store not with a shopping list but with a hand-full of coupons, brand loyalty is eroded.

A second practice which may well contribute to brand loyalty erosion in the long-run is the heavy use of deal merchandising. Consumers are becoming increasingly used to buying items only when they are on special. In fact, they are increasingly seeing new store formats which carry not a consistent stock of brands, but only those on special price promotions. This encourages brand switching. Once again, we find a very effective short-run strategy which may produce an unintended result in the long run.

Heavy reliance on deal merchandising also tends to move products through the distribution system in big lumps rather than in a smooth flow. This causes a loss of efficiency in both the distributor and manufacturer community. We arrive, therefore, at our second major topic of the day, total system productivity.

Although there is no perfect measure of productivity, the Bureau of Labor Statistics does provide us with a reasonable approximation. According to their data, over the last ten years productivity in food manufacturing has increased while food retailing productivity has actually declined.

Over the last ten years, as the industry has been repositioning itself for the consumer of the 1980s and beyond, it has also been repositioning itself for increased productivity. Taking but a few examples: average store size continues to increase allowing more efficient fixed asset utilization; UPC scanning continues to spread allowing development of a more productive front-end and the accumulation of item movement data; the Uniform Communication System has been successfully pilot tested and released making

possible direct communication of purchase orders and invoices among manufacturer, broker, and distributor computers; the use of small computers has exploded to streamline everything from inventory management to analyzing advertising effectiveness; and a joint industry study has just been released detailing recommendations for improving the efficiency of the coupon handling process throughout the entire food distribution system.

The list is long. The point is that the industry is beginning to make real progress on total system efficiency. Much of this progress is due to research sponsored jointly by the major manufacturer and distributor associations. This has been accomplished, as it should be, without government funding and without the creation of an elaborate oversight bureaucracy. There is no better current model for addressing total system productivity than the grocery industry.

Conclusion

All in all, the story of the food distribution industry is a healthy one. By developing a model for addressing total system efficiencies and by constantly monitoring customer behavior, this industry has been able to reposition itself for the 1980s and beyond.

On the customer front, the industry has moved from picketing to partnership. Rapid price increases in the early 1970s caught everyone by surprise, industry and consumer alike. On the heels of the Russian wheat deal and President Nixon's disasterous wage-price controls, consumers actually picketed retail food stores during this period.

In sharp contrast to attitudes during that time, we now find customers increasingly viewing the supermarket as a partner in helping them cope with economic uncertainty.

The industry has come to understand customer concerns and has moved to address them. During the last decade we have seen:

- a rapid expansion of the hiring of professional consumer affairs specialists

- a rapid expansion of generic food products and store brand offerings for the economy minded

- an increasing use of unit pricing to allow more effective comparison shopping

- a growing use of in-store information bulletins giving shopping tips and nutrition information

- a redesign of store formats to better accommodate the special needs and wants of each local market.

Perhaps the most dramatic move occurred with the creation of Food Marketing Institute in 1977. At that time the food distribution industry established itself in the Institute charter with the following words:

> "The grocery retailer, from the smallest corner store to the largest supermarket company, is the purchasing agent for the customer. At the same time, the grocer and his close working partner, the grocery wholesaler, are the means by which the farmer and other producers make their products available to the public. In these two functions, the grocery retailer and wholesaler serve to satisfy fundamental needs of everyone in our society." (emphasis added)

By striking this new balance the industry has made real and significant progress. In an economy where the norm of behavior has been for industrial armies always to prepare to fight the previous war, the grocery industry stands in sharp contrast. This industry is busily and continuously repositioning itself for the future.

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1983 Agricultural Outlook Conference, Session #32
Washington, D.C.

For Release: Wednesday, December 1, 1982

The Soviet Union and The World Grain Market

Even with apparent import demand down in 1982/83, Soviet trade continues to be the single most significant factor in the world's grain market. Last year, the USSR accounted for 20 percent of the world's wheat imports and a quarter of the world's coarse grain trade. The Soviets were the largest single buyer of wheat flour and rice. No wonder the grain world focuses on the outlook for the next Soviet crop and closely follows Soviet trade developments.

World grain trade patterns have shifted as the Soviets diversified sources of supply since the January 1980 grain embargo. Many of our export competitors have registered a significant jump in sales to the Soviets. The past 2 years have seen the Soviets take around three-fourths of the Argentine grain shipments, nearly a third of Canada's grain outgo and over 20 percent of Australia's grain exports. Commodities other than grain have also benefited from the Soviet's more prominent role as an importer as they have also taken significant qualities of soybeans and soybean meal and meat products.

Soviet Crop Outturns Continue to Come Up Short

The 1982 Soviet grain crop, currently estimated at 180 million tons, marks the fourth consecutive poor harvest. In fact, Soviet grain production in 7 out of last 10 years has fallen below 200 million tons. This has necessitated either a drawdown in stocks, imports or both to maintain consumption levels.

Grain production averaged well below the plan level of 220 million tons for the 1976-80 period. With production estimated to average only 170 million tons for the first 2 years of the current 5-year plan, it seems quite unlikely that the Soviets will be able to reach the plan projection of 238-243 million.

Grain area for harvest for the 1982 crop was only 122 million hectares, lowest since 1972. Recent years have seen more area devoted to summer-fallow. According to Soviet journalists, many problems have affected the ultimate crop outturn including delays in receiving production imputs, mismanagement of production resources, excessive losses at harvest and in transit, the list goes on and on. In addition, weather has struck repeated blows to grain yields in recent years. Drought and excessive summer heat have been a reoccurring problem over the Soviet grain belt.

USSR: Total Grain, Wheat, and Coarse Grains: Supply/Utilization 1972/73-1982/83

Year	Production	Trade (July/June) Imports	Trade (July/June) Exports	Availability 1/ July/June	Total 1/	Seed	Industrial	Food	Dockage/ Waste 2/	Feed	Stock Change 3/ July/June
				(Million Metric Tons)							
				Total Grains 4/							
1972/73	168	22.8	1.8	189	187	26	3	45	15	98	+2
1973/74	223	11.3	6.1	228	214	27	3	45	33	105	+14
1974/75	196	5.7	5.3	196	206	28	3	45	23	107	-10
1975/76	140	26.1	0.7	166	180	28	3	45	14	89	-14
1976/77	224	11.0	3.3	232	221	29	3	45	31	112	+11
1977/78	196	18.9	2.3	213	228	28	4	45	29	122	-16
1978/79	237	15.6	2.8	250	231	28	4	46	28	125	+19
1979/80	179	31.0	0.8	209	222	28	4	46	22	123	-13
1980/81 5/	189	34.8	0.5	223	228	27	4	47	28	122	-5
1981/82 6/	160	46.0	.5	206	206	27	4	47	16	112	0
Projected 1982/83	180	37.0	.5	216	216	27	4	47	18	120	0
				Wheat							
1972/73	86	15.6	1.3	100	98	14	1	15	8	41	+2
1973/74	110	4.5	5.0	109	96	14	1	34	16	30	+13
1974/75	84	2.5	4.0	82	93	14	1	34	10	34	-11
1975/76	66	10.1	0.5	76	87	15	1	35	7	30	-11
1976/77	97	4.6	1.0	100	92	15	1	35	14	28	+8
1977/78	92	6.6	1.0	98	108	15	1	35	14	44	-10
1978/79	121	5.1	1.5	125	107	14	1	35	14	43	+18
1979/80	90	12.0	0.5	102	115	15	1	35	11	53	-13
1980/81 5/	98	16.0	.5	114	117	15	1	36	15	50	-3
1981/82 6/	80	19.5	.5	99	99	15	1	36	8	39	0
Projected 1982/83	86	17.0	.5	102	102	15	1	36	9	41	0
				Coarse Grains							
1972/73	72	6.9	0.4	79	79	11	2	7	7	53	0
1973/74	101	6.4	0.9	106	105	11	2	7	15	70	+1
1974/75	100	2.7	1.0	101	100	11	2	7	12	68	+1
1975/76	66	15.6	--	81	84	12	2	7	7	56	-3
1976/77	115	5.7	2.0	119	116	12	3	7	16	78	+3
1977/78	93	11.7	1.0	103	109	11	3	7	14	74	-5
1978/79	105	10.0	1.0	114	113	12	3	7	13	79	+1
1979/80	81	18.4	--	100	100	12	3	7	10	68	0
1980/81 5/	81	18.0	--	99	101	11	3	7	12	68	-2
1981/82 6/	72	25.5	--	98	98	11	3	7	7	70	0
Projected 1982/83	85	19.0	--	104	104	11	3	7	8	75	0

1/ Availability excludes beginning stocks. Totals may not add due to rounding.
2/ Includes post harvest losses incurred in transport and storage.
3/ Minus indicates withdrawal from stocks.
4/ Total grain production, trade, and utilization figures include pulses, paddy rice, buckwheat, and miscellaneous grains in addition to wheat and coarse grains.
5/ Preliminary for trade, availability, utilization, and stocks change.
6/ Forecast for production, trade, availability, utilization, and stocks change.

Soviet Import Estimates Revised

Soviet grain-buying activity continues to lag well behind last year's record-setting pace. Soviet grain imports for 1982/83 are currently estimated at 37 million tons, substantially below last year's 46 million. Grain purchases from all origins for shipment in 1982/83 presently total around 17 million tons, about half the total at this time last year. Wheat accounted for roughly two-thirds of the Soviet early season buying.

The estimate of Soviet wheat imports as of early-December is placed at 17 million tons, down from the record-shattering 1981/82 estimate of around 19.5 million. So far during the 1982/83 marketing year, the Soviets appear to have purchased about 10 million tons of wheat--but none from the United States. Over the past 3 years, the Soviets purchased around 5 million tons annually from Argentina and Australia. However, prospects for a good 1982 wheat crop in Argentina have been more than offset by a poor crop in Australia. Consequently, Soviet wheat imports from these sources are likely to be lower this year, possibly totaling 3-4 million tons. However, reports out of the EC and Canada suggest that some additional sales from these sources are possible.

The estimate of Soviet coarse grain imports at 19 million is down nearly a fourth from a year ago. Purchases to date have been quite small, totaling only about 7 million tons. Grain agreements or trading arrangements with various suppliers will assure the Soviets nearly 8 million additional tons in the months ahead, leaving around 5 million still to be bought either from other origins or beyond basic agreement levels.

Grain Shipments Continue to Lag

September grain shipments to the Soviets from the major suppliers were well short of the record pace of over 5 million tons set in May. Preliminary indications for October point to some improvement. For the July-October period, the Soviets lifted slightly over 7 million tons of grain from the major suppliers. This is only around half their imports for the same period a year ago. At the recent U.S.-USSR consultations, the Soviets reported that grain purchases from all origins for shipment in the July-December 1982 period totaled 12-13 million tons, but that there could yet be some further purchasing for that shipment period. This suggests some improvement in the pace of Soviet imports during November and December to around 3 million tons a month, if shipping schedules are met.

Soviets Turn to More Grain Agreements

Recent years have seen the Soviets turn increasingly to trading agreements or arrangements to cover their annual grain import needs. Such arrangements presently assure the Soviet Union access to nearly 20 million tons of grains from all suppliers during the 1982/83 marketing year. In some cases, these agreements are much broader than grains, covering oilseeds, livestock products and other agricultural items.

One of the most important results of these agreements is that they have provided a mechanism for the expansion of grain trade beyond the agreement level. A good example is the recent announcement by Canada of sales to the

USSR Imports of Wheat and Coarse Grains by Source 1972/73 - 1981/82
July/June Years
(Million Metric Tons)

	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	Preliminary 1980/81	Projected 1981/82
Wheat										
U.S. 1/	9.5	2.7	1.0	4.0	2.9	3.3	2.9	3.9	3.0	6.9
Canada	4.2	1.6	.3	3.2	1.2	1.7	2.0	2.1	4.5	4.8
Australia	.9	.1	.6	1.2	.4	.3	.1	2.7	2.5	2.4
Argentina	--	--	.6	1.2	.1	1.1	--	2.0	3.0	3.1
EC	.7	--	--	--	--	--	--	.7	.9	1.7
Others	.3	.1	--	.4	--	.2	.1	.6	2.1	.6
Total*	15.6	4.5	2.5	10.1	4.6	6.7	5.1	12.1	16.0	19.5
Coarse Grains										
U.S. 1/	4.2	5.2	1.3	9.9	4.5	9.2	8.3	11.3	5.0	8.5
Canada	.9	.2	--	1.3	.2	.2	.1	1.3	2.3	4.4
Australia	--	0	.1	.8	.1	--	--	1.3	.4	.1
Argentina	.1	.3	1.1	.2	.2	1.6	1.4	3.1	8.2	10.2
EC	1.2	.5	.1	.5	.2	.2	.2	.2	.6	.7
Others	.5	.2	.1	2.6	.3	.6	--	1.2	1.5	1.6
Total*	6.9	6.4	2.7	15.6	5.7	11.7	10.0	18.3	18.0	25.5
Total										
U.S. 1/	13.7	7.9	2.3	13.9	7.4	12.5	11.2	15.2	8.0	15.4
Canada	5.1	1.8	.3	4.5	1.4	1.9	2.1	3.4	6.8	9.2
Australia	.9	.1	.7	2.0	.5	.3	.1	4.0	2.9	2.5
Argentina	.1	.3	1.7	1.4	.3	2.7	1.4	5.1	11.2	13.3
EC	1.9	.5	.1	.5	.2	.2	.2	.9	1.5	2.4
Others	.8	.3	.1	3.0	.3	.8	.1	1.8	3.6	2.2
Total*	22.5	10.9	5.2	25.7	10.3	18.4	15.1	30.4	34.0	45.0

-- Denotes less than 50,000 tons.
* Totals may not add due to rounding. Excludes rice and pulses.
1/ U.S. exports based upon Export Sales data, which normally include transshipments whereas Census data may not.

SOURCE: Based on reports of countries exporting to the USSR.

Soviets of 7.6 million tons, well above the 4.5-million-ton minimum. A calendar year 1982 agreement provided for minimum Argentine sales to the Soviets of 4 million tons of coarse grains. Sales to date of all grains total around 9 million tons.

The large number of Soviet agreements with grain suppliers has increased pressures on all potential exporters to either seek or maintain agreement positions with the Soviets.

Soviets Purchases of U.S. Grain Modest To Date

After a one-year lapse, the United States in 1981/82 regained its position as the largest grain supplier to the Soviet Union. The major difference from earlier years, however, was that the United States lost a significant share of the Soviet grain market to its competitors. The U.S. share of Soviet grain imports in 1981/82 totaled only around 33 percent compared with a pre-embargo average level of well over 50 percent.

The U.S. is expected to continue as the Soviets largest grain supplier in 1982/83, although the pace of sales to date cannot be too reassuring. As of November 17, U.S. grain sales to the Soviets totaled 3 million tons, exclusively corn. The Soviets have not as yet purchased any wheat from the 1982 U.S. crop. In fact, there have been no significant U.S. wheat sales to the Soviets since November 1981. The Soviets have expressed concern about the quality of the 1982 U.S. Hard Red Winter wheat crop. At the recent consultations held in the Vienna, the Soviets again raised the issue of the quality of U.S. grain that they had received. At these meetings, the United States agreed to continue working with the Soviets and grain companies to improve the arrival quality of U.S. grain. At that time, a team of Soviet specialist was invited to visit the United States for about 10 days beginning November 16 to study the U.S. wheat situation.

U.S. Offers Additional 15 Million Tons

Earlier this year, the United States and Soviet Union agreed to a second one-year extension of the U.S./USSR Long-Term Grain Agreement (LTA), which was to expire on September 30, 1982.

At the semi-annual consultations provided for under the grain agreement, held in Vienna on October 28, the U.S. officially advised the Soviet Union that, beyond the 8 million tons provided for in the agreement, the United States would make available an additional 15 million tons for Soviet purchase during the seventh agreement year (October 1, 1982-September 30, 1983) without the necessity of further consultations. No proportion of wheat and corn was specified. For any Soviet purchases made against the 15 million tons during November, and shipped within 180 days, the United States is extending the same assurances that are now given under Article II of the agreement to the basic 8 million tons of trade.

Domestic Use Holds Up Despite Short Crops

Soviet domestic grain requirements in recent years have averaged around 200 million tons. Food, seed and industrial use normally account for 75-80 million tons and vary little from one year to the next. Grain for feed

reached a peak of 125 million bushels in 1978/79. Feed use of grain has normally absorbed the bulk of any cutback in domestic utilization caused by significant crop shortfalls. During the 1979/80 - 1981/82 period when the annual grain outturn fell well short of requirements, the Soviets minimized the impact by dipping into stocks and expanding imports. As stockpiles shrank, the Soviets were forced to return more frequently to the world's granary, culminating in a record 1981/82 import of 46 million tons. These large imports, along with efforts to more effeciently use grain for feed and to expand use of other feed items helped the Soviets minimize adjustments in the livestock sector. Even with 9 percent less grain fed during 1981/82, the Soviets were able to reasonably maintain livestock inventories, although both slaughter weights and productivity continued to suffer.

Total grain availability is expected to be up in 1982/83 as large imports partially offset another poor crop. Consequently, domestic use, particularly feed use, is expected to register some recovery in 1982/83. With large world grain supplies and low prices, the Soviets might even add to grain stocks during 1982/83, although there is no evidence of this happening so far.

Livestock Sector Shows Some Signs of Recovery

Generally the outlook for the USSR livestock sector appears to be better this year than last with an improved grain crop and better forage supplies. Although performance in the Soviet livestock sector remains well short of planned levels and continues to reflect a stressed feed situation, some improvement is evident. Livestock inventories on October 1 continued to show record cattle, hog and poultry numbers as of that date.

The 343-kilograms average weights of cattle sent to slaughter during January-September were down 7 kilograms from a year ago and were the lowest weights for this same period since at least 1977. However, the number of cattle marketed during this 9-month period was the largest since 1978. While the average weight of hogs sent to slaughter, at 101 kilograms, remained at the same level as in 1981, it was down 4 kilograms from the peak reached in January-September 1978. Marketings were down 3 percent from a year earlier to the second lowest level in 6 years.

Total USSR meat production (slaughter weight) this year is expected to make a small gain and could reach 15.3-15.4 million tons, compared to the 15.2 million tons produced in 1981.

Total livestock inventories (in both socialized and private sectors) at the beginning of 1983 are expected to show record numbers of cattle, cows and poultry and little change in hog numbers, but a relatively large decrease in sheep and goats. In the latter case, the hot, dry conditions which prevailed during most of the summer months in the southern regions of Central Asia and Kazakhstan (where large numbers of these herds are concentrated) caused very poor conditions for grazing.

Summary

Four years of poor harvest have thrust the Soviets to the forefront of the world grain market. Last year, 1 of every 5 tons of grain that traded in world commerce went to the USSR. Soviet import needs appear to be down this

year, but they will still likely be the largest single buyer of wheat and coarse grains. Unless the Soviets enjoy a string of good harvests, they wil. continue to be a significant factor in grain trade. In spite of four poor grain harvests, the Soviets still managed to maintain livestock inventories, providing a sound base for future growth in the livestock sector and in potential feed demand. Concern about access to foreign grain supplies has encouraged the Soviets to initiate a series of grain trading agreements or arrangements with suppliers. These arrangements cover over half of the Soviets 1982/83 import needs of 37 million tons. If Soviet grain import demand should shrink in the future as a result of a series of good crops, competition for the Soviet market not protected by trading agreements could be fierce.

USSR Grain Area, Yield, and Production
1973-1980,
1981 (Preliminary) and 1982 (Forecast)

Grain	Area (Million Hectares)	Yield (Metric Tons Per Hectare)	Production 1/ (Million Metric Tons)
Wheat			
1973	63.2	1.74	109.8
1974	59.7	1.41	83.9
1975	62.0	1.07	66.2
1976	59.5	1.63	96.9
1977	62.0	1.49	92.2
1978	62.9	1.92	120.9
1979	57.7	1.56	90.2
1980	61.5	1.60	98.2
1981 (Preliminary)	59.2	1.35	80.0
1982 (Forecast)	57.0	1.51	86.0
Coarse Grains 2/			
1973	55.2	1.83	101.0
1974	59.4	1.68	99.7
1975	58.1	1.13	65.8
1976	60.9	1.89	115.0
1977	60.6	1.53	92.6
1978	58.0	1.82	105.4
1979	61.2	1.33	81.2
1980	57.9	1.40	80.5
1981 (Preliminary)	58.0	1.24	72.0
1982 (Forecast)	57.0	1.49	85.0
Total Grain 3/			
1973	126.7	1.76	222.5
1974	127.2	1.54	195.7
1975	127.9	1.10	140.1
1976	127.8	1.75	223.8
1977	130.3	1.50	195.7
1978	128.5	1.85	237.4
1979	126.4	1.42	179.2
1980	126.6	1.49	189.1
1981 (Preliminary)	125.5	1.27	160.0
1982 (Forecast)	122.0	1.48	180.0

1/ "Bunker weight" basis; not discounted for excess moisture or foreign material.
2/ Includes rye, barley, oats, corn, sorghum, and millet.
3/ Includes wheat, coarse grains, pulses, rice, buckwheat, and miscellaneous grains.

OUTLOOK FOR U.S. AGRICULTURAL
EXPORTS TO EASTERN EUROPE

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1983 Agricultural Outlook Conference, Session #32
Washington, D.C.
For Release: Wednesday, December 1, 1982

OUTLOOK FOR U.S. AGRICULTURAL EXPORTS TO EASTERN EUROPE

A new economic era seems to have begun in Eastern Europe. The expansionary policies of the seventies, financed largely by foreign credits, have been shelved, and the growth of domestic consumption, investment, and imports have all been curtailed. U.S. farm exports to the region have suffered greatly as a result. FY 1983 exports, for example, are estimated at $960 million, down substantially from previous years.

Hard Currency Credits Sustanined Economic Growth

During the seventies the East European countries generally followed policies encouraging growth in per capita income, while stabilizing retail prices for staple foods. To satisfy consumer demand for higher meat consumption and to obtain hard currency from exports, growth in livestock production was higher than that for domestic feed. The expanding livestock sector generated a growing demand for grain imports and protein supplements.

Coupled with ambitious industrial development plans based on imported technology, Eastern Europe as a whole had to rely on hard currency credits which by mid-1982 increased to approximately $79 billion. U.S. agricultural exports benefited from these expansionary domestic policies so that by 1980 U.S. agricultural exports to Eastern Europe--more than $2 billion worth--were almost as large as they were to all of South America. Less positively, however, by FY 1981, 40 percent of all U.S. agricultural exports to Eastern Europe, including 95 percent of those to Poland, were moving under U.S. credit guarantee programs.

Currently, January-September 1982 agricultural exports to Eastern Europe are running 53 percent below last year. The volume of major exports--grain, soybeans, and soybean meal--are all down with soybean meal exports off 57 percent, grain exports down 51 percent, and soybean exports off 12 percent. Grain exports to Eastern Europe reached their peak in 1980 at 10.4 million tons and averaged 7.2 million tons over the last 5 years. Soybean and soybean meal exports also peaked in 1980 at 732,000 and 1.7 million tons, respectively. Shipments of these 3 commodities accounted for almost 90 percent of the value of U.S. agricultural exports to Eastern Europe. Agricultural exports to Eastern Europe have represented approximately 5 percent of total U.S. agricultural exports in recent years.

Poland, the German Democratic Republic (GDR), and Romania have traditionally been our major customers in the region. Until recently Poland was our largest market, taking about one-third of U.S. farm shipments to Eastern Europe. However, for the first nine months of this year, Poland has dropped to fourth place behind the GDR, Yugoslavia, and Romania. As long as credit remains tight and the poor condition of the Polish economy continues there is little chance Poland will resume its place as the number one U.S. agricultural market in Eastern Europe.

Debt Rescheduling Buys Extra Time

Disappointing economic and hard currency export performance, the breakdown of the Polish economy and the maturity of a large portion of Eastern Europe's debt have combined to produce the current economic crisis in the region.

Net hard currency debt in mid-1982 for Eastern Europe was approximately $79 billion. Poland leads the region with foreign debt at approximately $25 billion. Unable to service its debt, the country has just signed a rescheduling agreement with commercial lenders covering payments due this year of approximately $3.5 billion. This is the second year in a row that Poland has rescheduled its commercial debt and Polish officials have already expressed their desire for a third such agreement for 1983. Other major debtors are Romania ($10.2 million), Yugoslavia ($17 million) and the GDR ($12.7 million), all traditionally major U.S. farm markets.

In addition to Poland, debt repayments have been particularly burdensome for Romania which is currently negotiating a rescheduling agreement with its commercial lenders following a similar agreement for 1982 with its government creditors. For the region as a whole, only Bulgaria and Czechoslovakia, small U.S. agricultural markets, appear best suited to service their debt because of traditionally conservative hard currency import and borrowing policies.

Slowdown in Economic Growth, Livestock Production Foreseen

Faced with mounting repayments and sharply reduced credit availability, officials in the region have been forced to cut imports and domestic consumption and to expand exports. To facilitate this, economic growth must decelerate in Eastern Europe. Targets for 1982 increases in national income range between -8 percent in Poland and a traditionally optimistic 5.5 percent in Romania. For the 1981-85 plan period, much smaller increases in national income are anticipated than in previous plans.

An integral part of the anti-import policies is a reduction of agricultural imports. Deficits on agricultural trade accounted for an average 30 percent of the region's total trade deficits in 1976-80. To reduce the demand for imported feed all countries have scaled down targets for livestock production. This policy change has been forced on some countries such as Poland where a shortage of imported feed has virtually shut down the broiler industry. Also, the hog population has continued to fall and is now 2 percent lower than October 1981. On the

other extreme, Czechoslovak officials have implemented a voluntary reduction in hog numbers of approximately 10 percent over year-earlier figures. Officials hope to increase production of forages and shift holdings from the heavy concentrate-using hogs to cattle. It is thought that Czechoslovakia can achieve grain self-sufficiency soon at a lower consumption level. Likewise Romania, if contented with modest growth, is not far from self-sufficiency. It is currently estimated that a one and four percent decline in cattle and hog numbers in Eastern Europe, respectively, are likely this year. Cattle holding should decline significantly in Poland and hog numbers down most in Poland and Czechoslovakia.

Decreases Likely in Meat Consumption

With lower animal inventories and no improvement foreseen in slaughter weights, per capita meat consumption in 1983 will decline or at best remain stable. Consumption should suffer from the continuation of general food rationing in Poland and Romania and from recently announced retail price increases in all countries except the GDR. These price increases were substantial, especially in Poland where some staple meat prices rose 375 percent.

Per capita meat consumption will continue to fall in Poland to an estimated 52-53 kg. compared with a probable 57 kg. this year and 74 kg. in 1980. Czechoslovak officials have planned a decrease in consumption this year to 80 kg. from 85 kg. per capita in 1982. Little improvement is expected in 1983.

1982/83 Crop Output Mixed

Domestic East European grain supplies will be much improved over last year with production estimated to approach a record 100 million tons. Both wheat and coarse grain harvests are above last year's results. However, most other crops did not fare as well. Oilseed production is down 7 percent to 3.6 million tons. Sugar beet and potato output are also down. The shortfall in potatoes is especially severe in Poland where production of this important livestock feed fell 10 million tons to 33 million tons. This would indicate the third disappointing potato harvest in a row. Hay and forage output was mixed as dry summer weather reduced yields in several countries.

Although lower livestock inventories will reduce 1982/83 feed requirements, this year's record grain crop is still inadequate to cover the shortfalls in nongrain feed production. For example, total Polish domestic 1982/83 feed supplies, in oat unit equivalents, are estimated to be down 6-9 percent compared to 1981/82.

Only Marginal Improvement Expected in Credit Availability

With domestic feed production still below requirements, credit availability will determine the overall level of East European agricultural imports in 1983. The credit outlook remains poor, although slightly better than in recent months. Under the 1982 commercial debt rescheduling agreement, Poland should receive approximately $550 million in new short term credit from its lenders in 1983. The U.S. share of

this new credit is estimated at between $50-$70 million. Polish officials have stated that the majority of this credit will be spent on U.S. farm imports. Also, Yugoslavia was recently granted a CCC blended credit valued at $60 million for the purchase of cotton. This credit represents purely additional sales for the United States as Yugoslavia has been a marginal importer of U.S. cotton for years. However, these are isolated instances and do not signify a return to past levels of lending in Eastern Europe.

Outlook for U.S. Agricultural Exports Poor

The lack of credit combined with lower growth in the livestock sector and 1982's record grain harvest will keep 1983 U.S. agricultural exports to Eastern Europe low. Grain exports should be especially hard hit as officials adjust herd numbers to match domestic grain and forage availability. Exports of soybeans and soybean meal may fare better as the East European capability for protein feed production is well below demand.

U.S. agricultural exports to Eastern Europe for FY 1983 are estimated at $960 million, only slightly above the depressed FY 1982 level. Grain imports, primarily corn, from the U.S. should be just under 4 million tons, down from last year's 4.3 million tons, and the lowest level in many years. Total grain imports by Eastern Europe are forecast at 9.4 million tons in 1982/83, down from an estimated 13.3 million tons in 1981/82.

However, soybean and soybean meal imports from the United States are estimated to increase in FY 1983. The region's lower oilseed crop and the preference in most countries to maintain adequate protein rations for livestock should result in imports of approximately 575,000 tons of U.S. soybeans and 650,000 tons of U.S. soybean meal in FY 1983. Total 1983 soybean imports are estimated at 1.3 million tons, up 33 percent from this year, although estimated soybean meal imports, at 3.3 million tons, will be down slightly from this year's expected level.

Several factors may alter these early U.S. export estimates, the most important being CCC credit availability. Currently, only Hungary, Romania and Yugoslavia are eligible for credits. Poland lost its eligibility following USG suspension of its most-favored-nation tariff treatment. It is expected that Yugoslavia will be requesting further CCC credits in addition to the $60 million blended authorization. Without such credits, the U.S. share of a shrinking East European market could be even lower.

PROSPECTS FOR AGRICULTURAL TRADE WITH THE PRC

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1983 Agricultural Outlook Conference, Session #32

For release: Wednesday, December 1, 1982

Along with the rapid growth of agricultural production since 1978, the People's Republic of China has also increased imports of U.S. grains, cotton, and soybeans. However, this upward trend in U.S. exports will not continue in the next few years. The growth of China's grain imports has slowed. Imports of cotton and soybeans have acutally dropped and are not likely to recover quickly because of the success of China's farm programs.

Between 1977 and 1981, China's imports of farm products increased from $1.9 to an estimated $5.3 billion. Larger imports of both grain and cotton contributed to most of the increase. Grain imports rose from 6.8 million tons in marketing year 1977/78 to 14.5 million tons in 1981/82 and are expected to reach 16 million tons in 1982/83. Wheat has accounted for most of the increase in imports; coarse grain imports rose to a record 3 million tons in 1978/79 but have since declined. Imports in 1981/82 totalled only about 1.3 million tons although they may reach 2 million tons this year.

Higher grain imports have been caused by both rising incomes and policies favoring specialization. Greater incomes in both urban and rural areas have pushed up demand for higher quality grains such

Table 1-- Output of major farm products, 1970-82 1/

Item	1970	1975	1977	1978	1979	1980	1981	1982
	million tons							
Total grain 2/	240.0	284.5	282.7	304.8	332.1	320.5	325.0	335.0
Wheat	29.2	45.3	41.1	53.8	62.7	54.2	58.5	59.5
Rice	110.0	125.6	128.6	136.9	143.8	139.3	143.2	146.5
Cotton	2.3	2.4	2.0	2.2	2.2	2.7	3.0	3.3
Oilseeds 3/	17.0	16.0	14.7	16.4	17.4	20.2	24.3	26.1
Sugar crops	15.5	19.1	20.2	23.8	24.6	29.1	36.0	39.0
Tobacco	N/A	N/A	1.1	1.2	.9	.9	1.3	2.0
Meat 4/	6.0	8.0	7.8	8.6	10.6	12.1	12.6	N/A

N/A = not available.

1/ Except for 1982, data are drawn from various State Statistical Bureau reports. The 1982 figures for wheat, rice, cotton, and oilseeds are November 1982 U.S. Department of Agriculture estimates.
2/ The Chinese definition--wheat, rice, coarse grains, other miscellaneous grains, tubers, and soybeans.
3/ Soybeans, cottonseed, rapeseed, peanuts, and sunflowerseed.
4/ Pork, beef, mutton, and lamb.

as wheat and rice. At the same time government procurements of grain from the countryside have increased very little. On top of this, the government has been transferring a greater share of grain that it does procure back to the rural areas as part of the incentive program to encourage farmers to shift land and resources to producing cash crops. This has further incrased shortfalls in the urban areas. These two factors have combined to increase import demand for grain, particularly wheat, despite the growth of China's grain production.

While grain imports have been rising, the dramatic growth of cash crop production has reduced import demand for crops such as

cotton and oilseeds. Cotton imports, which rose to a record 849,000 tons in marketing year 1979/80, fell to 566,000 tons in 1981/82 and a further sharp decline to 280,000 tons is projected for 1982/83. Imports of soybeans and soybean oil have been similarly affected. Soybean imports reached a peak of 810,000 tons in 1979/80 but have since fallen off -- imports in 1982/83 are expected to total only about 400,000 tons. Soybean oil, imports of which equalled or exceeded 100,000 tons in 1979/80 and earlier years as China tried to alleviate a serious shortage of vegetable oils, fell to only 25,000 tons in 1981/82 and no imports are expected in 1982/83.

This pattern of trade is indicative of a policy of import substitution, in which larger imports of grain are being used to permit reductions in imports of other agricultural products. The larger grain imports free domestically-procured grain for transfer to areas which are expanding cash crop production, and are viewed as a necessary cost of reducing imports of other agricultural products. China's foreign trade policy, despite the cutback of imports of industrial goods during the current readjustment period, appears aimed at limiting growth of agricultural imports, leaving foreign exchange free for purchases of nonagricultural products.

A cautious approach to imports is also evident in the livestock sector. Although policies announced in 1977 and 1978 envisioned rapid development of livestock production in and around urban areas and, by implication, rapid growth of grain-intensive feeding operations, the policies in place since 1979 have been much more cautious. Present policy favors a more balanced approach with simultaneous development of range-fed cattle, sheep, and goats

together with a modest expansion of concentrated feeding operations in and around the large cities. This approach has slowed the growth of demand for animal feed. One of the reasons for this change was to prevent the rapid growth of import demand for livestock feed. Another reason was recognition of the problems involved in quickly transferring hog and poultry production out of the private sector. Such a shift requires building an extensive infrastructure for feed production and distribution, veterinary services, slaughtering, cold storage, and marketing.

Some of the coarse grains China now imports are being used for feed, but an important part is likely still used for human consumption, and part of this year's increase in projected import levels is due to shifts from wheat to corn because of low corn prices. China has also begun to import small amounts of malting barley for use in brewing.

This pattern of rising grain imports and falling imports of other farm products is evident in U.S. agricultural exports to China. From 1977 to 1980, U.S. agricultural exports to China increased from $66 million to $2.3 billion. Over this period shipments of both grain and cotton rose sharply, reaching a combined total of $2.0 billion in 1980. Shipments of soybeans and soybean oil also grew to $226 million in 1980. Wheat shipments continued to increase in 1981, following the signing of the Sino-U.S. grain agreement in October 1980. But U.S. exports of cotton, soybeans, and soybean oil tailed off as China reduced purchases of these items and total U.S. exports of farm products to China dropped 13 percent to $2 billion. A further decline to about $1.5 billion is expected this year because of both lower prices for exports and further cuts

in China's purchases of U.S. cotton.

Table 2-- U.S. agricultural exports to China by fiscal year

Item	1977/78	1978/79	1979/80	1980/81	1981/82
			------ m. tons ------		
Wheat	1.05	2.68	4.15	7.96	8.22
Corn	--	2.75	1.79	.73	1.12
Soybeans	.06	.14	.81	.47	.37
Cotton	.11	.14	.51	.25	.19
Soybean oil	.11	.06	.10	.26	--
			------ m. $ ------		
Wheat	133.8	357.0	691.7	1420.3	1268.1
Corn	--	291.6	225.5	108.9	138.7
Cattle hides	.2	--	8.0	5.1	13.2
Soybeans	16.3	37.8	200.7	136.4	95.3
Cotton	150.9	193.5	754.5	481.4	292.4
Tallow	14.2	.6	16.0	6.3	7.0
Soybean oil	54.4	35.9	56.3	17.1	--
Other	.3	.8	4.3	8.3	4.3
Total	370.1	917.2	1957.0	2183.8	1819.0

The production levels achieved by China in the last several years are less striking when viewed in a longer-run perspective. Growth of crop production since the mid-fifties has averaged only about 0.6 percent per year, with most of the growth coming in the last several years. As recently as 1977, aggregate production of major crops on a per capita basis was no higher than it had been during the mid-fifties, despite rapid growth of modern inputs such as irrigation and fertilizer supplies and extensive introduction of new varieties of major crops such as wheat and rice. For the last several years, therefore, China has been playing catchup -- making substantial gains by utilizing surplus production capacity created

by inefficient and wasteful policies of the Cultural Revolution period. These high growth rates cannot be sustained for an extended period of time.

Looking ahead to the next several years, growth rates are likely to slow. Inputs are certain to grow more slowly. The rapid rise in supplies of chemical fertilizers has ended, no further large increases in irrigated area are in sight, and large increases in production of agricultural machinery are neither in sight nor would they offer the prospect of major gains in production if they could be achieved.

This slowdown in input growth means that future increases in crop production will have to largely come from greater efficiency in using existing inputs. Considerable latitude for gains in efficiency does exist. For example, chemical fertilizers are often used wastefully and nutrients are lost through volatilization before they have their full effect on crops. More efficient utilization could increase effective nutrient supplies. Better management of existing irrigation systems could also have a positive impact on yields.

These sources of growth, while potentially substantial, place a premium on continued flexible policies for agriculture, a predominant role for the local levels in making decisions about cropping patterns and techniques, and continuing improvement in management at the local level. This means that reassertion of strong central controls over agriculture and restricting local choice in questions of cropping patterns is likely to have a serious negative impact on the growth of production.

Continued technological progress and effective dissemination of

new technology will also be crucial to agricultural progress. Given the severe impact of the Cultural Revolution on China's agricultural research capabilities, China is facing an extended period of difficulty as research and extension capabilities are rebuilt. Expanded exchanges of technology with the West and greater opportunities for Chinese scientists to work with their foriegn counterparts will be an essential ingredient in maintaining the recent momentum of agricultural progress, as will the continuation of China's recent efforts to expand the agricultural education system.

The implication of the slowing pace of input growth seems clear: China will have to continue the relaxed agricultural policies of the past several years and continue its more open approach to international contacts if the momentum of agricultural growth of the last several years is to be maintained. If this can be done, then yields should continue to rise, although at rates generally below those of the recent past.

Agricultural imports are not likely to grow dramatically in the next several years, particularly if China is successful in generating moderate growth of farm production. The annual level of grain imports may gradually increase, with continued growth of demand in the import-dependent urban areas and gradual expansion of the livestock sector in the same areas. There is likely to be no immediate reversal of the recent slump in imports of other farm commodities, as long as production of cash crops such as oilseeds and cotton make modest gains. An important variable in this picture, however, is what happens to acreage of cash crops. The

Government is stressing that the contraction of grain area must stop and that future gains in production of cash crops will have to come from higher yields. Whether the Government will be able to halt this decline is far from certain, however. Continued decline in grain area would tend to increase grain import requirements by more than would otherwise be the case. However, it would also lead to even lower imports of non-grain commodities.

USER FEES FOR GOVERNMENT SERVICES: THE GRAIN INDUSTRY EXPERIENCE

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1983 Agricultural Outlook Conference, Session #33
Washington, D.C.

For Release: Wednesday, December 1, 1982

In the past two years, the grain industry has confronted four major areas of user fee proposals that affect it directly. User fees have been considered for total or partial funding of: 1) federal grain inspection and weighing services conducted by USDA's Federal Grain Inspection Service; 2) examinations of warehouses by USDA's Agricultural Marketing Service; 3) regulation of futures trading administered by the Commodity Futures Trading Commission; and 4) maintenance of the inland waterways. While imposition of user fees for futures trading regulation and increased fees for the inland waterways still are pending, increased fees for warehouse examinations and grain inspection and weighing have been implemented. With the change to greater industry financing of these federal programs, government and industry both have learned some valuable lessons.

Arguments can be made for user fee systems to support selected areas of government services. The General Accounting Office, in a March 1980 report, stated that "Federal agencies provide goods, services and privileges that benefit identifiable recipients. Charging for these benefits is equitable since it assures that costs are borne by beneficiaries rather than tax payers in general."

In practice, however, the National Grain and Feed Association has found it is not always easy to determine who the beneficiaries of government programs really are.

User Fees for Federal Warehouses

Consider, for example, the Federal Warehouse Program that is administered by the Agricultural Marketing Service. Since it was enacted in 1916, the purpose of the federal warehouse program has remained unchanged: to maintain a system of examination and licensing of warehouses in order to: 1) protect farmers and others who store agricultural products in public warehouses; and 2) assure the integrity of warehouse receipts as documents of title.

The federal warehouse system is entirely voluntary. Warehousemen apply for federal licenses, and if approved, come under the federal oversight of AMS. Over the years, the federal warehouse program has earned a reputation as a quality program. It is widely utilized, with more than 40 percent of all commercial grain storage capacity now federally licensed. Despite strong industry support for the program, an informal survey we conducted when user fees were first proposed showed that some 50 percent of all federal warehouses would probably drop out of the program if full-cost user fees were assessed.

Although some might conclude that such a reaction from industry was indicative of the true economic value of the program, such a conclusion would be wrong. USDA recognized the nature of the problem in trying to fund the full costs of the program through grain industry assessments. In its report to the Secretary of Agriculture, the USDA elevator task force stated that "Prime beneficiaries (of the federal warehouse program) cannot be reached for user fee assessment and one beneficiary (the warehouseman) is being 'tapped' for full amount. Anyone who has an interest in the stored product benefits: the producer or other depositor, Commodity Credit Corporation, banks or other lending agencies, bonding and insurance companies, and warehousemen...."

A cooperative effort between USDA and the grain industry resulted in a solution to this problem. As the owner of a considerable amount of grain in commercial storage and the primary lender to farmers who use grain as collateral, the Commodity Credit Corporation has always been a primary beneficiary of the federal warehouse program. For years CCC has used the warehouse inspection program funded and operated by AMS as a cost-free means of keeping tabs on federal warehouses that store government grain. As an alternative to charging full-cost fees to warehousemen, USDA proposed that the program costs be shared between Commodity Credit Corporation and the industry. This is the user fee plan that went into effect in 1982. Given that more than 90 percent of all federally licensed facilities stayed in the fee-funded program, this plan probably maximized the total cost savings to government while preserving the integrity and viability of the federal warehouse program.

User Fees for Grain Inspection

The move from government to industry funding had relatively minor impact on the federal warehouse program. However, the change to user fees for grain inspection and weighing services had rather dramatic consequences for the Federal Grain Inspection Service.

Prior to 1977, USDA's Grain Division was responsible for official grain inspection services in the U.S. With passage of the U.S. Grain Standards Act in 1976, the Federal Grain Inspection Service was created to perform official inspection and weighing services.

Although the industry had been paying fees for the direct costs of inspection and weighing for several years, the administration's budget proposal for fiscal year 1982 also required the industry to pay for costs associated with supervision and administration of the program. What this meant to the industry was an increase in total charges to cover roughly 90 percent of all FGIS outlays. Prior to this, industry user fees had covered slightly over 50 percent of FGIS expenditures. The increase was significant, amounting to approximately three-tenths of a cent per bushel or about $10 for every covered hopper car officially inspected and weighed.

At the time of the user fee proposal, FGIS had every characteristic of a government agency going out of control. At its beginning in 1977, FGIS had fewer than 800 employees. By the end of fiscal 1981, however, FGIS employment had more than doubled to nearly 1800 full-time workers. Much of the increase in FGIS personnel occurred in layers of supervisory and administrative positions. In 1980, approximately 45 cents out of every dollar expended by FGIS

went to pay for supervisory and administrative costs. FGIS had become involved in several program areas that either duplicated other government programs already in existence or extended well beyond the statutorily defined mission of the Federal Grain Inspection Service.

The grain industry was not willing to accept higher FGIS user fees without provisions for cost control. And, in its Budget Reconciliation bill last year, Congress imposed three important provisions on the FGIS user fee program: 1) a ceiling on expenditures for administrative and supervisory services; 2) a periodic Congressional reauthorization to insure responsible administration and operation of the program; and 3) establishment of an industry advisory committee.

This legislation brought significant improvements in FGIS operations. Much of the administrative overhead has been cut. The organizational structure has been trimmed and FGIS employment has been reduced by more than one-third. The industry advisory committee has proved to be a tremendous asset in directing needed changes in FGIS to maintain its quality of service at a higher level of efficiency. With these changes, many of them very difficult for a new agency administrator to make, has come a renewal of industry confidence and support for the agency.

The Rationale for User Fees

In looking back at the grain industry's recent experiences, I would like to make a few observations about user fees. I believe that there is continued support, both within and outside the government, for the concept of user fees. In some areas of government we have gone too far in using general tax revenues to support agencies and projects that benefit a small group or specific segment of the nation. I know of very few in industry who would not support the concept that everyone should pay their own way for the benefits of government programs that they receive.

However, the practical problems associated with user fee programs for government services can be enormous. A primary obstacle in charging user fees is, first, to determine who benefits -- who should be paying the bill? Beneficiaries are not as readily identified as it may seem. The official grain inspection and weighing services performed by FGIS benefit the grain trade, of course. But they also benefit the producer, the processor, the consumer and every citizen of the U.S. because these services enhance the reputation of U.S. export grain, thereby contributing to our earnings from grain sales abroad.

As I mentioned earlier, the federal warehouse program benefits the warehouseman, the farmer, the banker, Commodity Credit Corporation and a number of other groups. In the case of the fees that have been proposed to fund the Commodity Futures Trading Commission's regulation of commodity markets, every consumer throughout the world benefits from having an open, competitive futures exchange to efficiently price grain for distribution and consumption during the marketing year.

Thus far, the government has dealt with this issue of who benefits and who pays by imposing fees only on those industry segments most directly associated with a particular government activity -- the grain industry pays for federal grain inspection; warehousemen and CCC pay fees for warehouse examinations. The only justification for this approach is that these segments, by their close association with the program, are the ones most likely to understand the true economic value and importance -- that is, the ones most willing to pay for the services. The problem with this idea is that the economic value received by direct users of the programs may represent but a small fraction of the entire benefits to society. This presents an inherent danger in the user fee concept: If assessed fees are too high, direct users may not be willing to pay for the amount of government services that would ensure maximum net benefits to all "users," including those who benefit indirectly.

The answer to this problem seems to lie in arriving at the proper mix of funding from industry fees and general government revenue. In the case of FGIS, the industry now pays 90 percent of all costs of the program, with government appropriations funding the remaining 10 percent. With these higher industry fees, we have seen a significant shift from the use of official services to unofficial inspection and weighing. If this trend continues, the existence of the program could be in danger, at least in the interior where official inspection is not mandatory. I believe a valid hypothesis in this case is that 90 percent may be more than an equitable share of FGIS costs to impose on the industry. At some point we may need to reassess which of the FGIS costs really should be borne by the government through general tax revenues.

There is one benefit of user fee programs for government services that should not be overlooked. In the case of FGIS, the industry took an active interest in the efficiency and operations of the agency when it realized that it would be responsible for a substantial portion of the FGIS operating budget. With the establishment of an industry advisory committee, the grain trade has been able to communicate its views concerning which programs are important and necessary and how the agency's operations might be adjusted to promote efficiency and cost-effectiveness. Through a cooperative industry/government exchange of ideas over a two-year period, FGIS has been transformed into an efficient government agency that provides the essential services called for in its mission. These changes would not have been made without the move to greater industry funding. Despite all the rhetoric about reducing the scope and size of federal government operations, FGIS is one of very few agencies that has made any headway in this area.

Other agencies considering user fees should realize that budgets will be scrutinized in ways different from OMB, Appropriations Committees, GAO, and agency budget offices. Industry now will have a searching eye for programs that are not cost-effective, if industry is expected to bear the costs of those programs. Despite the drawbacks of government user fee systems -- including identifying the true beneficiaries and devising fee systems that provide equitable cost sharing -- this realization that user fees can encourage more active involvement by the private sector in reviewing government operations provides a glimmer of hope that it may yet be possible to keep the costs of the federal government under control.

AGRICULTURAL TRADE POLICY - E.C. VIEWS

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1983 Agricultural Outlook Conference, Session #34
Washington, D.C.

For Release: Wednesday, December 1st, 1982

OUTLOOK '83

Agricultural trade has always been a particularly difficult issue in international discussions, because of the vital importance of agriculture for every country in the world.

Adequate food supplies are the indispensable requirement for independence, social stability and general economic growth. The provision of sufficient supplies implies the existence of an efficient, flexible agricultural industry within the country and balanced trade in food and feedstuffs with foreign countries.

As countries are faced with differing national, economic, social, historical and political situations, these agricultural policies are by necessity different too. They differ in their domestic support programmes as well as in their import and export policies. But even in one and the same country such policies can differ according to the commodity as exemplified by the U.S. and the E.C.

Consequently, it would be unwise to suggest that agricultural policies, including agricultural trade policies could be brought into line with policies in the industrial sector where much more uniform conditions prevail.

For the reasons mentioned above it would also be unrealistic to suggest that agricultural import and export policies should be mainly based on the aspect of comparative advantages. A number of food shortages and embargoes in recent years have shown that major dependence on supply from the world market is not a convincing proposal. But even in the absence of such extreme conditions the volatility of the world market is considerable. This becomes evident when we compare world trade with world production. In the period from 1977 to 1979 for example the ratio for cereals was 13,4%, for feed grains 11,6%, for oilseeds 17,5% and for all meats 3,1%. These figures show that any imbalance between world supply and demand results in even more important world price fluctuations which may have serious effects on importing and exporting countries according to the situation. Even a reasonable stock policy may not be sufficient to smooth out such fluctuations if natural supply and demand imbalances are accompanied by worldwide recession, credit shortages and an overly strong currency in a major exporting country, as is the

case right now. By the way, had importing countries created buffer stocks earlier, the situation for U.S. exports might be even worse today.

The preceding observations should help towards better understanding of the European Community's (E.C.) Common Agricultural Policy (CAP).

When the original six member countries created the European Economic Community (EEC) in 1957, they were confronted with highly divergent agricultural policies and in particular very different agricultural structures in the various countries, resulting as elsewhere from differing natural, economic, historical and political situations. Harmonization of these policies within a common European policy was not only a major challenge but it also became a key instrument of European integration in general. The CAP will maintain this key role for many years to come and in particular in the context of the accession of Spain and Portugal.

The Treaty of Rome creating the EEC enumerates as five main objectives of the CAP:

- to increase productivity
- to secure a fair standard of living for the farm population
- market stability
- supply assurance
- and reasonable consumer prices

In order to achieve these objectives the following three principles were developed:

1. Establishment of a single market characterized by the free movement of agricultural products within the European borders.

2. The Community preference - the mechanism which protects the single E.C. market for a number of products from world price fluctuations and ensures growth in intra-Community trade.

3. The principle of financial solidarity among member states to finance together through a common fund, the cost of the CAP.

The above mentioned objectives and principles are mostly the same as those in the U.S., although their implementation had in part to take place in a different way due to differing conditions in the E.C.

The main instrument of implementation was the creation of market regalations establishing price targets which are subject to annual review.

Today, 70% of agricultural production in the Community (grain, milk, beef, veal and other products) benefits from more or less elaborate price support mechanisms bolstered mostly by governmental intervention buying. For the other 25% of production

(e.g. eggs and poultry) more indirect support mechanisms apply. Finally, for a small percentage of production, aid is given in the form of deficiency payments.

As a whole this programme has worked rather well in the past. It helped to integrate European agriculture and to adapt it smoothly to more efficient forms of production. The agricultural labor force declined by half from 18 million to less than 9 million (including our newest member, Greece), farm size doubled (average farm size now about 45 acres) and productivity jumped up. Average farm income increased steadily in the earlier years and kept until 1975 in line with incomes in the industrial field; since 1976 real farm income remained stagnant or even declined as in 1979 and 1980. However, notable income differences still exist between various agricultural regions in the Community. These discrepencies can only be overcome through a strong and effective regional and social policy towards which important steps have already been taken.

The aim of market stability and to ensure reasonable prices to consumers was also reached. Although food prices are generally higher in the Community than in the U.S., the influence of farm prices in the housewife's shopping basket should not be over-estimated as food prices include a large and growing proportion of costs quite independent from the prices paid to the farmer.

Finally, the aim of supply security has been reached for some agricultural items to a degree even of over-self-suffiency, e.g. dairy products, sugar, barley and some types of wheat. However, for other products and particularly such animal feedstuffs as soya, corn, tapioca, etc., required for intensive breeding, the Community has increased its dependence on external supplies which is not without danger as the soya embargo in 1973 showed.

These evolutions accompanied by growing budgetary costs for the E.C., the need to develop new E.C. policies in areas other than agriculture, the recognition that unchanged direct price supports may give the richer farmer too much and the smaller farmer notenough, and finally the aspect of the upcoing accession of Spain and Portugal to the E.C., made the E.C. institutions think about a reform of the Common Agricultural Policy.

Therefore, additional steps in the direction of an adjustment of our policy have been taken.

Since last year Community sugar no longer benefits from financial government support. All storage and disposal costs of surplus sugar have to be born by the producers themselves. The results of this change are encouraging. The E.C.'s 1982 sugar production is expected to drop by 9% below 1981 levels and a further decline is expected for next year.

In the dairy sector we have applied for some years a farmer co-responsibility levy which already covers 10% of the surplus disposal costs. In addition, the Council decided this year to take appropriate action if deliveries of milk in 1982 exceed those in 1981 by more than 0.5%. As this has become reality the E.C. Commission recently proposed to reduce the 1983/84 intervention prices by 2,2%. The E.C. Council will have to decide on this proposal in Spring 1983.

For the cereals sector the Council fixed this year a guarantee threshold of 119.5 million tons (all cereals excluding durum wheat) for the 1982/83 period. If average production for the three marketing years 1980/81 to 1982/83 exceeds this level, intervention prices in 1983/84 will be reduced. However, if imports of cereals substitutes in the marketing year 1981/82 exceed 15 million tons, the guarantee threshold will be increased accordingly. As things stand now, some reductions will probably have to be applied next year. Independently from the application of this mechanism the Council is committed to pursue a prudent price policy keeping support price increases below inflation rates in order to bring over a number of years E.C. cereal prices closer to support price levels in other major grain exporting countries. Such policies should increase the utilization of Community cereals in animal feed, reduce the E.C.'s dependence on feedstuff imports from third countries, allow for relatively lower price support increases for animal products in the future and finally keep growth of E.C. cereals exports within reasonable limits.

The question may be asked why we do not intend to apply the same mechanism of full farmer responsibility for the disposal of surplus dairy products and cereals as we do now in the sugar sector. The answer to this question is that the structural differences between the sectors mentioned are too important.

Furthermore, our present cereals exports can by no means be considered excessive.

A certain level of production beyond immediate domestic needs is either necessary or appropriate for a number of reasons:

- we have to shield ourselves against the possilibity of either domestic or international crop shortages not only in wheat but also in substitutable products such as soybeans or corn
- we have to remain able to fulfill our food aid commitments
- we have to give our member states the possibility to utilize their natural resources in the most productive way in order to obtain the necessary means for buying imports of other agricultural and non-agricultural products such as oil
- we contribute through our exports to a diversification of sources for importing countries which leads in the long term to more stable supply and demand conditions on the world market.

It is well understood that the Community will continue to respect its GATT obligations and particularly those under the new Subsidy Code. At the same time nobody can expect the Community to renounce its rights which it has under the same provisions. The E.C. farmers have to have a chance to participate in a equitable way in expanding international trade.

The E.C. has for some time been confronted with the argument that export competition is fine as long as it does not involve export subsidies. But this is not what the Subsidy Code says. Our export refunds simply bridge the gap between E.C. domestic prices and world market prices, which mostly are determined by other exporting countries. The refunds are therefore not intended to undercut world prices or to gain more than an equitable share in world markets. Consequently, they are in conformity with the Subsidy Code provisions. By the way, the U.S. and others apply subsidies with effect on exports too.

The Subsidy Code was a compromise after long and difficult negotiations in the Tokyo Round which ended only three years ago. It may not be considered as an optimal solution by some major contracting parties, but it is the only basis for orderly international trade which we have at present.

It would be unrealistic to expect that the E.C. could give up its present set of agricultural policies of which import levies and export refunds are an integral part. It is the Community's basic decision to maintain stability on its domestic market, which at the same time contributes also to stability in international markets. If the Community with about 270 million people and the largest single share of world imports were not to pursue such a policy, the fluctuations on the world market in supply and demand and even more in prices could be devastating.

What can, however, be expected is, as indicated earlier, that the Community will in major commodity sectors bring its prices closer to world market conditions. Such a move would further reduce the relative importance of import levies and export refunds in the E.C.'s external trade. But such a development will take some time.

We would hope that other countries would at the same time re-examine and adjust their own systems which in the case of the U.S. should bring about the abolition of various import quotas.

In the meantime the major exporting countries including the E.C. should use all possibilities to cooperate with the aim to analyze and solve existing problems in a pragmatic way parellel to the analytic work going on in GATT and OECD. A "subsidy war" which was threatened on this side of the Atlantic as an alternative cannot be a solution for anybody. All parties would lose in the end.

The following examples show that pragmatic solutions are possible:

New Zealand and the E.C. have cooperated for some time in stabilizing the dairy export market, where prices consequently doubled in recent years. The Community contributes to this success by heavy and costly disposal of dairy surpluses on the domestic market, a way which should be more actively followed by the U.S. in its present situation of large CCC dairy stocks.

In the sugar sector the Community also cooperates very closely with the International Sugar Organization in order to stabilize world prices. Although not yet a member of the organization the E.C. voluntarily took 2 million tons of white sugar from the market and is considering additional measures to strengthen world prices. It is expected that, in addition, its new sugar regime as described earlier will further reduce E.C. production.

I would believe that such cooperation should also be possible among major grain exporting countries. In the end nobody can have any interest in selling his products at a loss. If U.S. target prices have any meaning they are as indicators showing which prices U.S. producers should as a whole at least obtain to stay in business in the long term. Present market prices, as everybody knows, are well below those targets and it would be too easy to blame E.C. exports for this situation. The E.C.'s wheat world market share has not increased over the last 12 years at a time when the U.S. share increased from 38,4% to nearly 45%. In addition, wheat production increases in the U.S. during the last four marketing years, were more than double the Community's annual wheat grain exports during that period. Furthermore, the E.C. is a massive importer among others of soybeans, corn and corn products and does not compete in these products on the world market. Therefore again, the reasons for present low prices lie elsewhere and they should be properly addressed. When this will be the case, the E.C. will in my view be ready to participate in a productive dialogue with the U.S. and other partners in order to find solutions to present problems.

In other areas of common US/EC interest bilateral contacts should take place whenever problems arise. Otherwise insufficient information and misinterpretations may produce tensions which could burden our relations. We have seen in the past that in many cases such sort of dialogue is the only way to achieve mutually acceptable results.

A cooperative relationship between the U.S. and the E.C. is in the best interest of the U.S. Both in industrial and agricultural trade with the E.C. the U.S. enjoys a considerable surplus which in the agricultural sector was constantly increasing over recent years and now amounts to nearly $7 billion. By the way half of our agricultural imports from the U.S., worth about $9 billion, enters the E.C. duty and levy free. Such a deficit of $7 billion shows its real dimension when we consider that the E.C. is not only United States' best customer but also the world's. The E.C.'s overall deficit in agricultural trade amounts to about

$25 billion at a time when the U.S. enjoys an overall agricultural surplus of the same order. However, our common interests go beyond our bilateral trade relations. The U.S. and the E.C. are not only each other's most important customer but our countries are the main participants in world trade. The international trading system depends therefore on our productive cooperation in order to progress. In addition, we share other interests of more global nature, which may be even more important.

It is therefore essential that we overcome present disputes in agricultural trade questions in a spirit of cooperation. I am confident that we will achieve this goal. We all hope that the forthcoming US/EC cabinet level meeting in Brussels on December 10, will show the way.